User's Guide

Racing Car Diagnostic Display

for Racing Engine Management Systems

Technical support

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Table of contents

1. Introduction....4
2. Overview....4
2.1. Main functions....4
2.2. Inputs....4
2.3. Technological parameters....5
3. Installation and wiring....6
3.1. Connectors....8
3.1.1. Main Connector 1....8
3.1.2. Main Connector 2....9
3.1.3. Keyboard Connector....11
4. Standard features....12
5. Connecting engine management system....16
5.1. DTA....16
5.2. Link....17
5.3. MoTeC....23
5.3.1. MoTeC M800 and other MoTeC ECUs with CRC32 protocol....23
5.3.2. MoTeC M4....33
5.4. Syvecs....40
5.5. Vi-PEC....51
5.5.1. VTS....51
5.5.2. iVTS....58
5.6. VEMS....62
5.7. None....64
6. Connecting sensors....65
6.1. Connecting analog sensors....65
6.1.1. Passive sensors....66
6.1.2. NTC....67
6.1.3. PT100-PT1000....67
6.2. Connecting switch sensors....68
6.3. Connecting impulse type sensors....68
6.4. Connecting the thermocouples....68
7. Configuration Options....69
7.1. Entering data....69
7.2. Setting the alerts....70
7.3. RPM LED bar setting....73

7.4. Brightness setting....74
7.5. Analog parameters....75
7.6. Defining a calibration equation for analog sensors....76
7.7. Others....79
7.7.1. Setting the impulses....79
7.7.2. Fullscreen warning....80
7.7.3. ECU type....80
7.7.4. Start screen....80
7.7.5. DTA gear by shaft....80
7.7.6. Load defaults....80
8. Firmware update....81
9. Safety regulations....85
10. Figures list....86
11. Tables list....89

1. Introduction

RCD Display is a universal display panel, which can visualize data from sensors attached, and can communicate with the engine controller unit.

The RCD Display can communicate with ECUs via CAN buses.

Supported types:

- DTA
  - S40 PRO
  - S60 PRO
  - S80 PRO
  - S100 PRO
- Link
  - G4 storm
- MoTeC
  - all ECUs with CRC32 protocol
  - M4
- VEMS
- Syvecs
- Vi-PEC Vi-PEC
  - VTS (v10000 or later)
  - iVTs

2. Overview

2.1. Main functions

- Display 5,7" 320 x 240 pixel
- Different screens
- Programmable RPM LED bar
- External control panel
- Communicating: CAN, RS232
- User defined limits
- Flexible sensor calibration

2.2. Inputs

- 2 pcs "K" typ. thermocouple
- 6 pcs Analogs 0-15V
- 5 pcs Digital input (buttons)
- 4 pcs General digital input

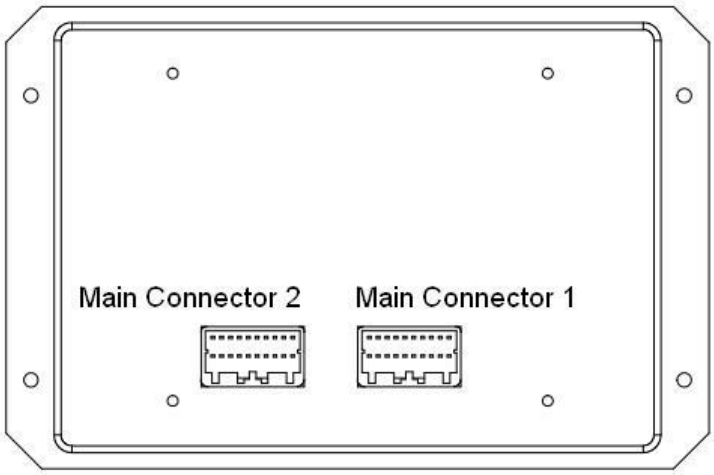
- 1 pcs Phototransistor
- 1 pcs CAN
- 1 pcs RS232

2.3. Technological parameters

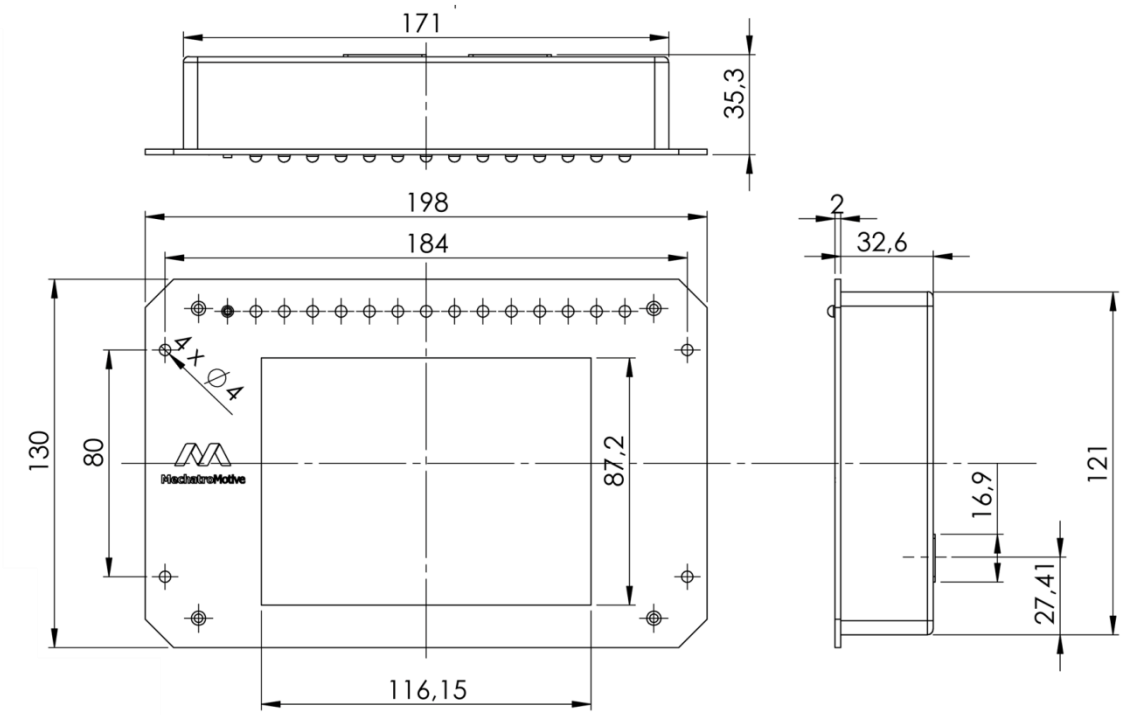
- Dimensions: 198 x 130 x 36 mm
- Voltage: 10 V - 15 V
- Power consumption: 1 A
- Size of display: 5,7 ”
- Resolution: 320 x 240 pixel
- Frequency of freshening: 60 Hz
- Color depth of display: 256 bit
- Maximal brightness: 800 cd/m2
- Contrast Ratio: 800 : 1
- Operating temperature range: -20 °C – °60 C

3. Installation and wiring

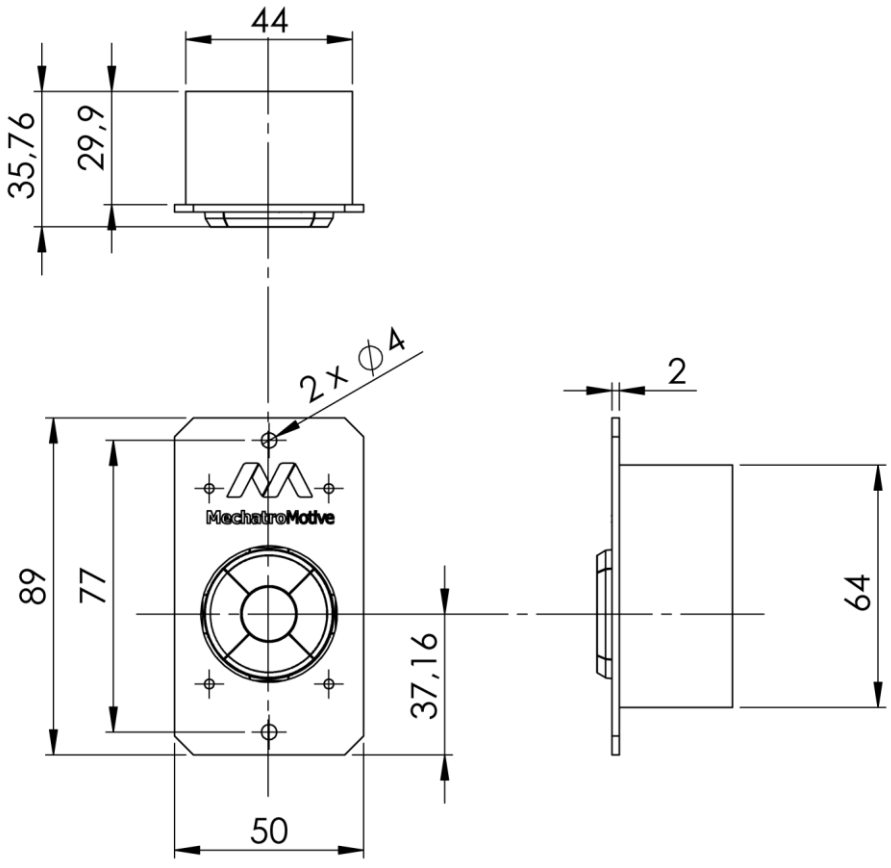
- Be careful when you install the panel, use vibration resistant self-locking nuts!
- When routing the cables, ensure of their integrity, avoid contact with moving parts of the vehicle!
- With the supplied pins you can carry out the necessary wiring.
- Be sure to connect the connectors at the back of the panel and the wiring harness to the appropriate place!



1. Figure - Main connectors



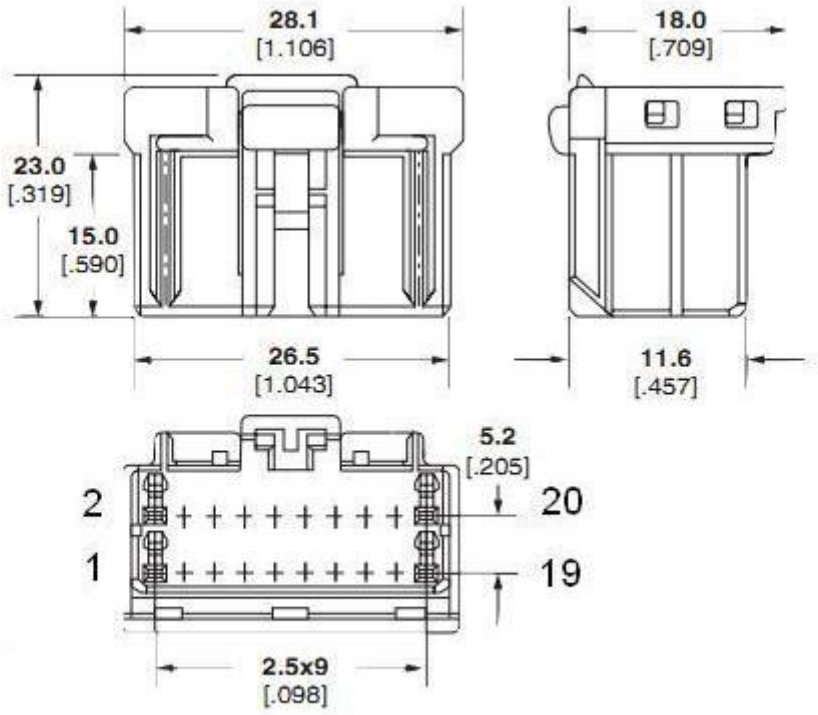
2. Figure - Mounting dimensions of the main unit



3. Figure - Navigation panel mounting dimensions

3.1. Connectors

3.1.1. Main Connector 1



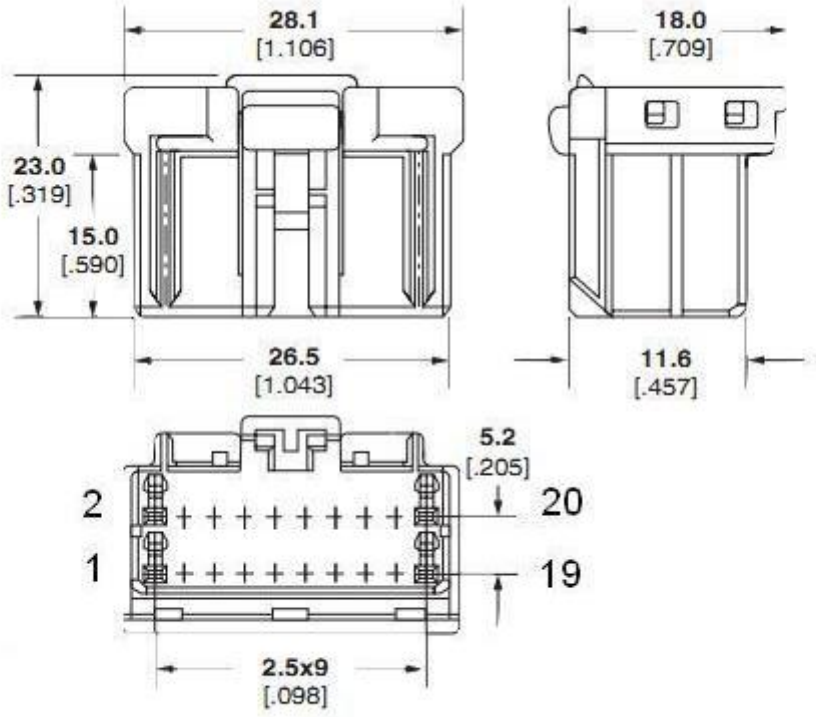
4. Figure – Main Connector 1

Pin No.	Function with ECU	Function without ECU
1	12V_In	
2	12V_In	
3	5V_Out_Ref	
4	5V_Out_Ref	
5	NC	
6	Temperature_K_1 (Positive)	K_1
7	Temperature_K_2 (Positive)	
8	Analog_Input_0V-15V_1	Fuel level
9	Analog_Input_0V-15V_2	Manifold Absolute Pressure
10	Analog_Input_0V-15V_3	Water temperature
11	Analog_Input_0V-15V_4	Oil temperature
12	Analog_Input_0V-15V_5	Fuel pressure
13	Analog_Input_0V-15V_6	Oil pressure
14	NC	

15	Analog_GND	
16	Analog_GND	
17	GND	
18	GND	
19	CAN_H	
20	CAN_L	

1. Table - Main Connector 1 pinout

3.1.2. Main Connector 2



5. Figure - Main Connector 2

Pin No.	Function	Function without ECU
1	12V_In	
2	Keyboard_Sw_5	
3	Keyboard_Sw_4	
4	Keyboard_Sw_3	
5	Keyboard_Sw_2	
6	Keyboard_Sw_1	
7	Impulse_1	Engine rpm
8	Impulse_2	Vehicle speed

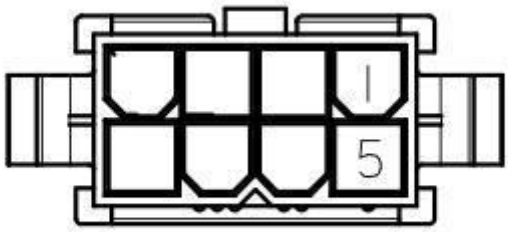
9	Impulse_3	
10	RS232_RX	
11	RS232_TX	
12	Digital_Input_1	
13	Digital_Input_2	
14	Digital_Input_3	
15	Digital_Input_4	
16	NC	
17	NC	
18	NC	
19	NC	
20	GND	

2. Table - Main Connector 2 pinout

The input cables of Pin 2-6 are the cables of the Keyboard Connector. These cables can be colored or numbered, as you can see in the **3.Table**- Keyboard Connector pinout.

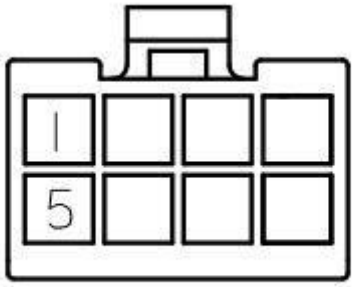
3.1.3. Keyboard Connector

Male connector to navigation panel (Micro-Fit Jr.)



6. Figure – Keyboard Connector (Male)

Female connector to the wiring harness side (Micro-Fit Jr.)



7. Figure - Keyboard Connector (Female)

8-wire gray double-insulated round cable. The cables can be colored or numbered.

Pin No.	Function	Color of the cable	Number of the cable
1	12V+	Red	6
2	GND	Gray	yellow-green
3	NC	White	-
4	SW_1	Blue	5
5	SW_2	Yellow	4
6	SW_3	Brown	3
7	SW_4	Green	2
8	SW_5	Pink	1

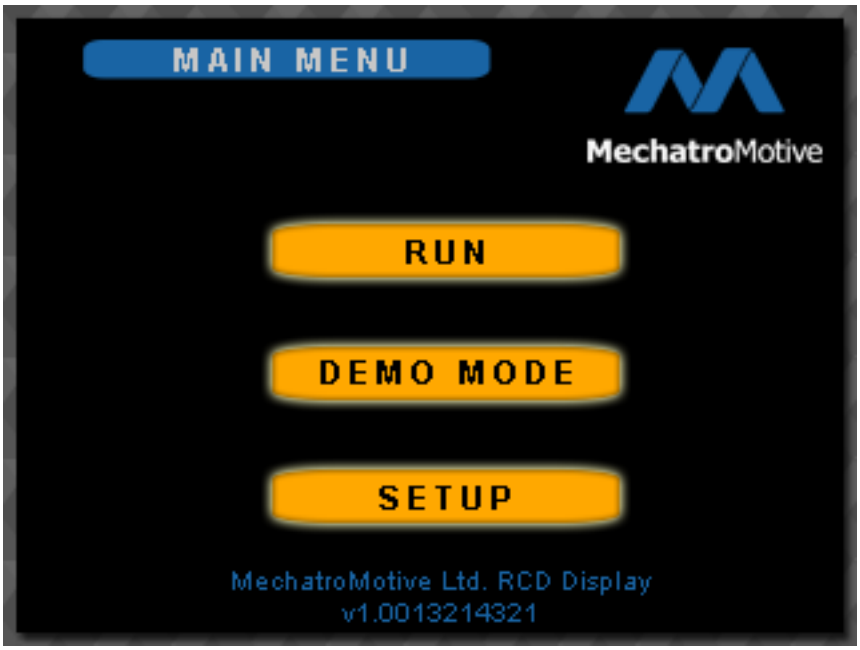
3. Table - Keyboard Connector pinout

4. Standard features

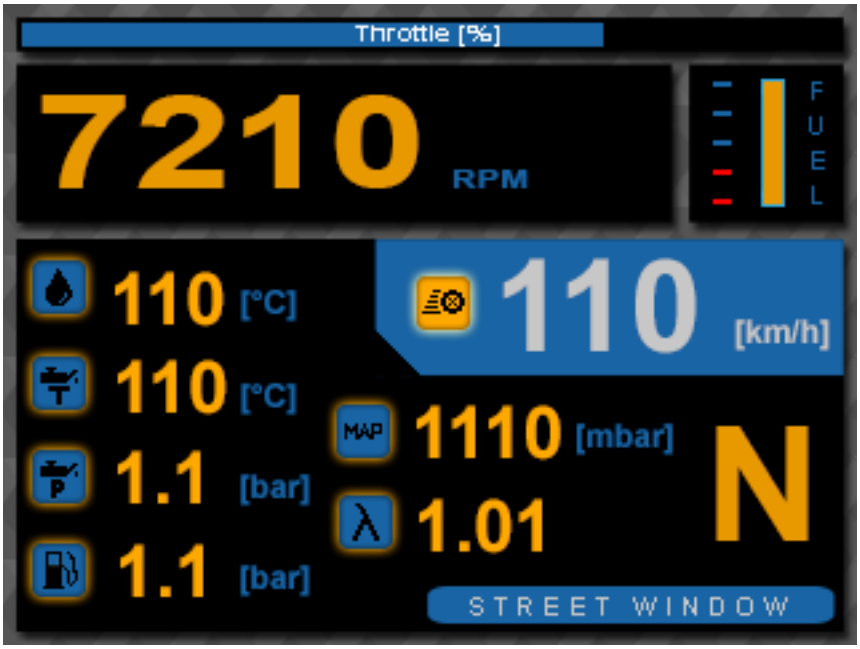
For handling the display use the external control panel. Using the buttons you can switch between screens, enter data and perform settings.

Menu Structure

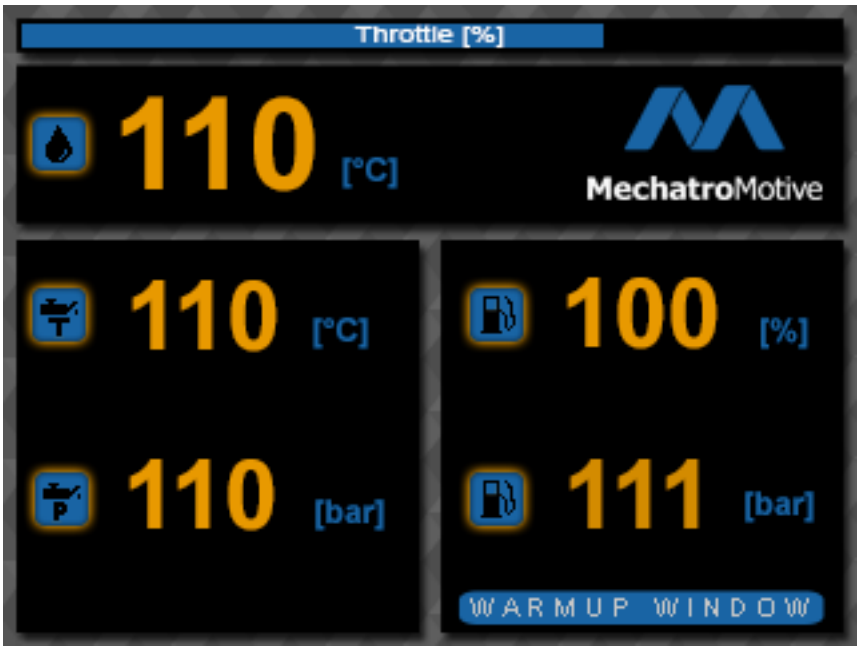
- **MAIN MENU**
  - **RUN**
    - RACE WINDOW
    - STREET WINDOW
    - WARM UP WINDOW
    - DIAG 1 WINDOW
    - DIAG 2 WINDOW
    - DIAG 3 WINDOW
  - **DEMO**
    - RACE WINDOW
    - STREET WINDOW
    - WARM UP WINDOW
    - DIAG 1 WINDOW
    - DIAG 2 WINDOW
    - DIAG 3 WINDOW
  - **SETUP**
    - LOWER LIMITS
    - UPPER LIMITS
    - LED RANGES
    - BRIGHTNESS
    - ANALOGS
    - OTHERS



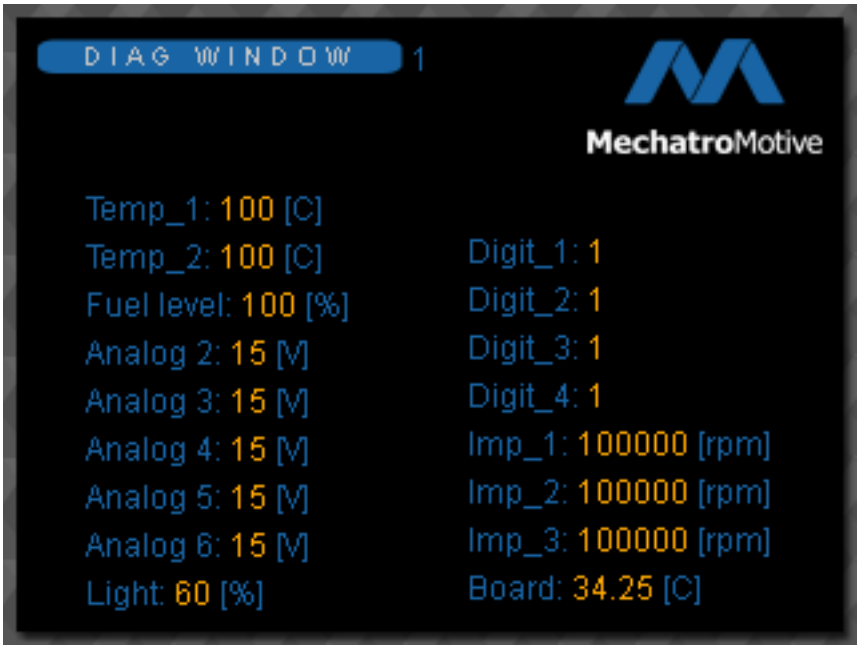
8. Figure – Main menu



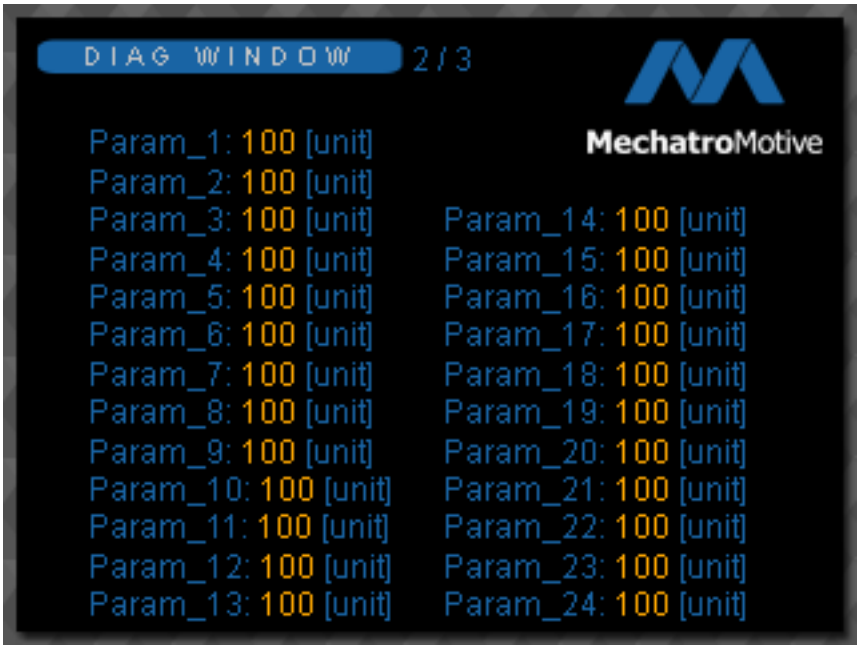
9. Figure – Street window



10. Figure - Warmup window

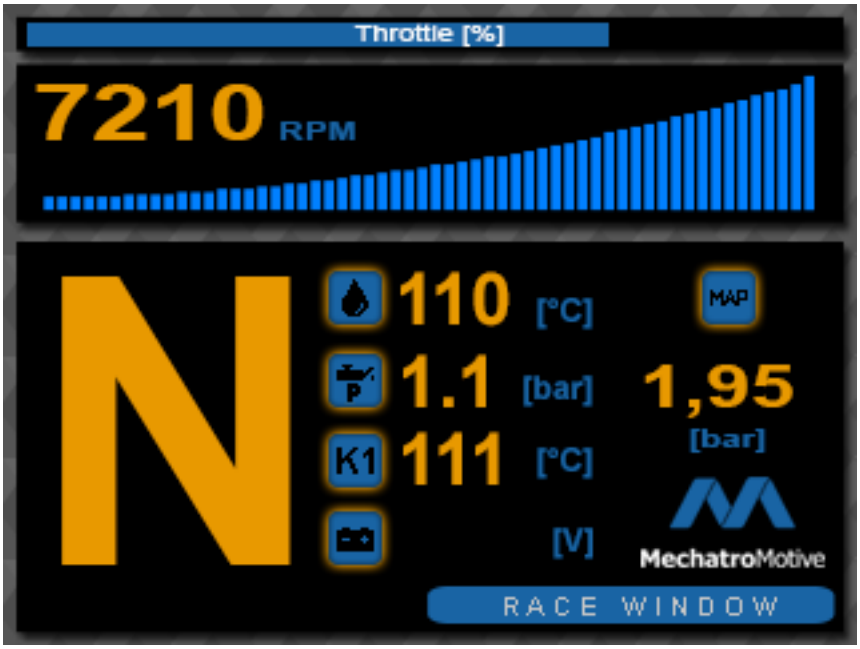


11. Figure – Diag 1 window



12. Figure – Diag window 2 / 3

Displayed parameters depending on the type of the engine management will be shown on 1 or 2 screens.



13. Figure – Race window

5. Connecting engine management system

5.1. DTA

Data from DTA Engine Management System:

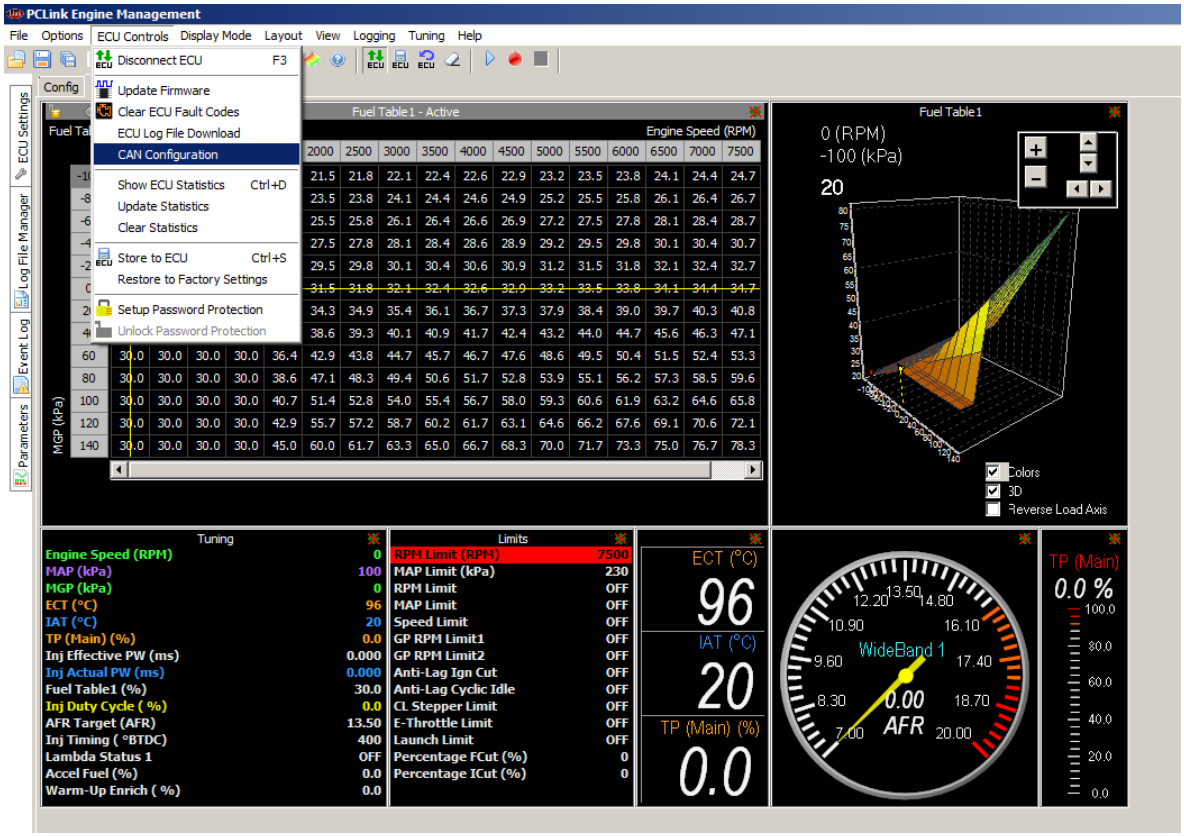
Parameter	Description	Unit
RPM	Motor rpm	1/ford
TPS	Throttle position sensor	%
Water Temp	Coolant temperature	C
Air Temp	Air Temperature	C
MAP	Intake manifold pressure	Kpa
Lambda	Lambda	x 1000
KPH	Vehicle speed	x 10 km/h
Oil P	Oil pressure	Kpa
Fuel P	Fuel pressure	Kpa
Oil Temp	Oil temperature	C
Volts	Battery voltage	x 10 V
Fuel Con.	Fuel Consumption (h)	L/Hr x 10
Gear	Gear	-
Advance Deg		x 10
Injection	Injection time	ms x 100
Fuel Con.	Fuel Consumption (km)	L/100Km x 10
Ana1	Analog Input 1	mV
Ana2	Analog Input 2	mV
Ana3	Analog Input 3	mV
Cam Advance		x 10
Cam Targ		x 10
Cam PWM		x 10
Crank Errors		
Cam Errors		

4. Table - DTA parameters

The frequency of data, which arrive from motor controlling unit, is the sending frequency.

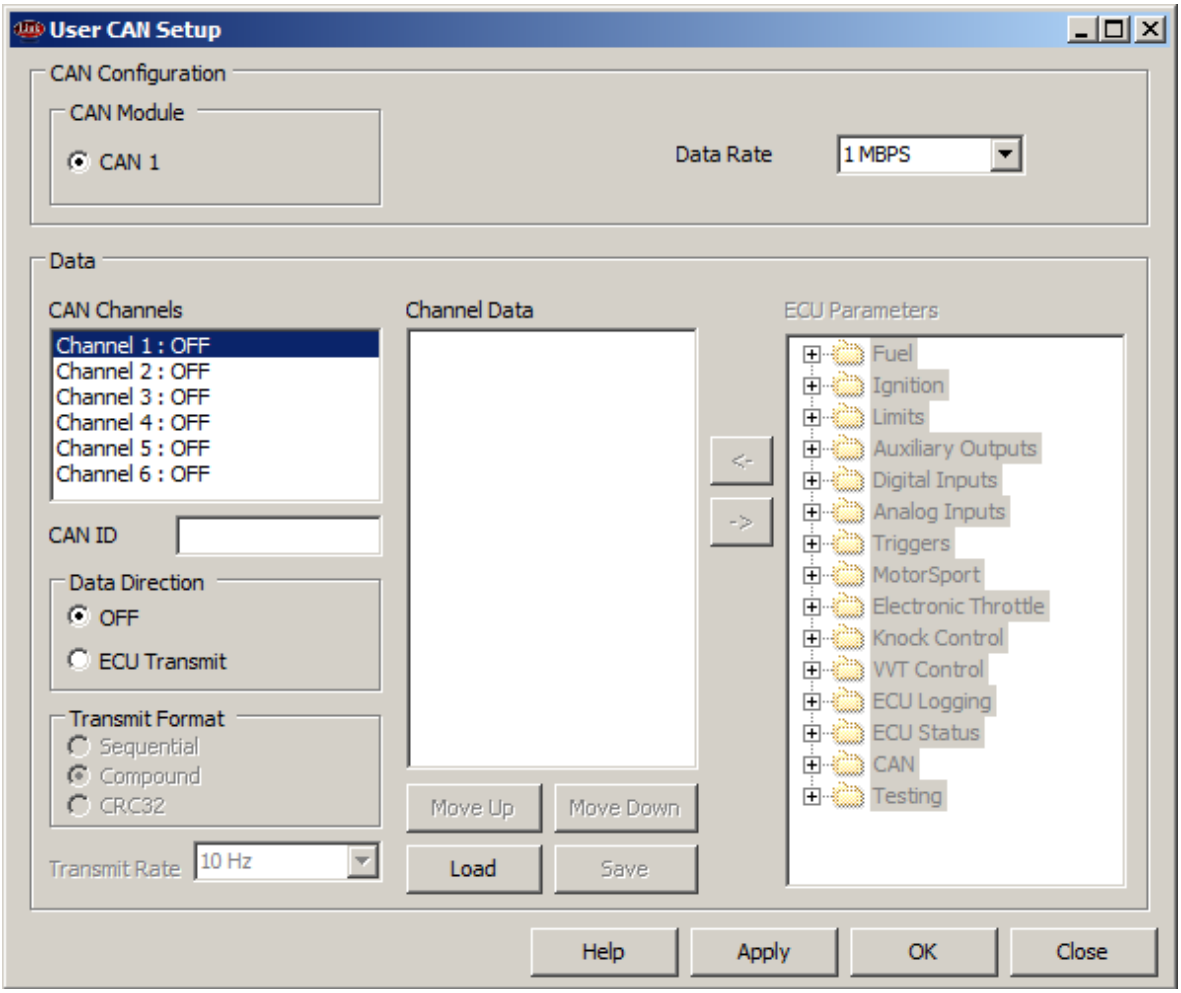
5.2. Link

In order to operate your motor controller properly with the RDC display, you have to make the following settings in the PCLink G4 software.



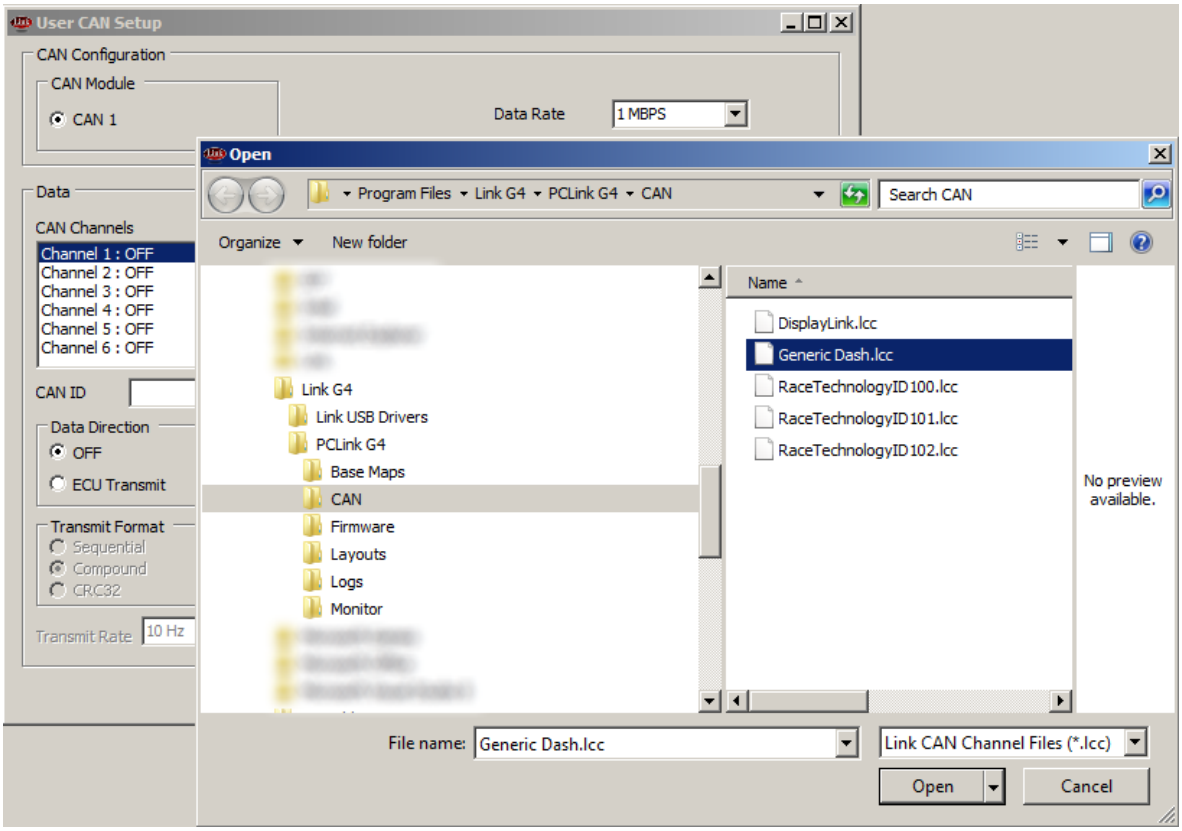
14. Figure – PCLink PrintScreen_1

Open **ECU Controls menu → CAN Configuration**. You will see the following screen:



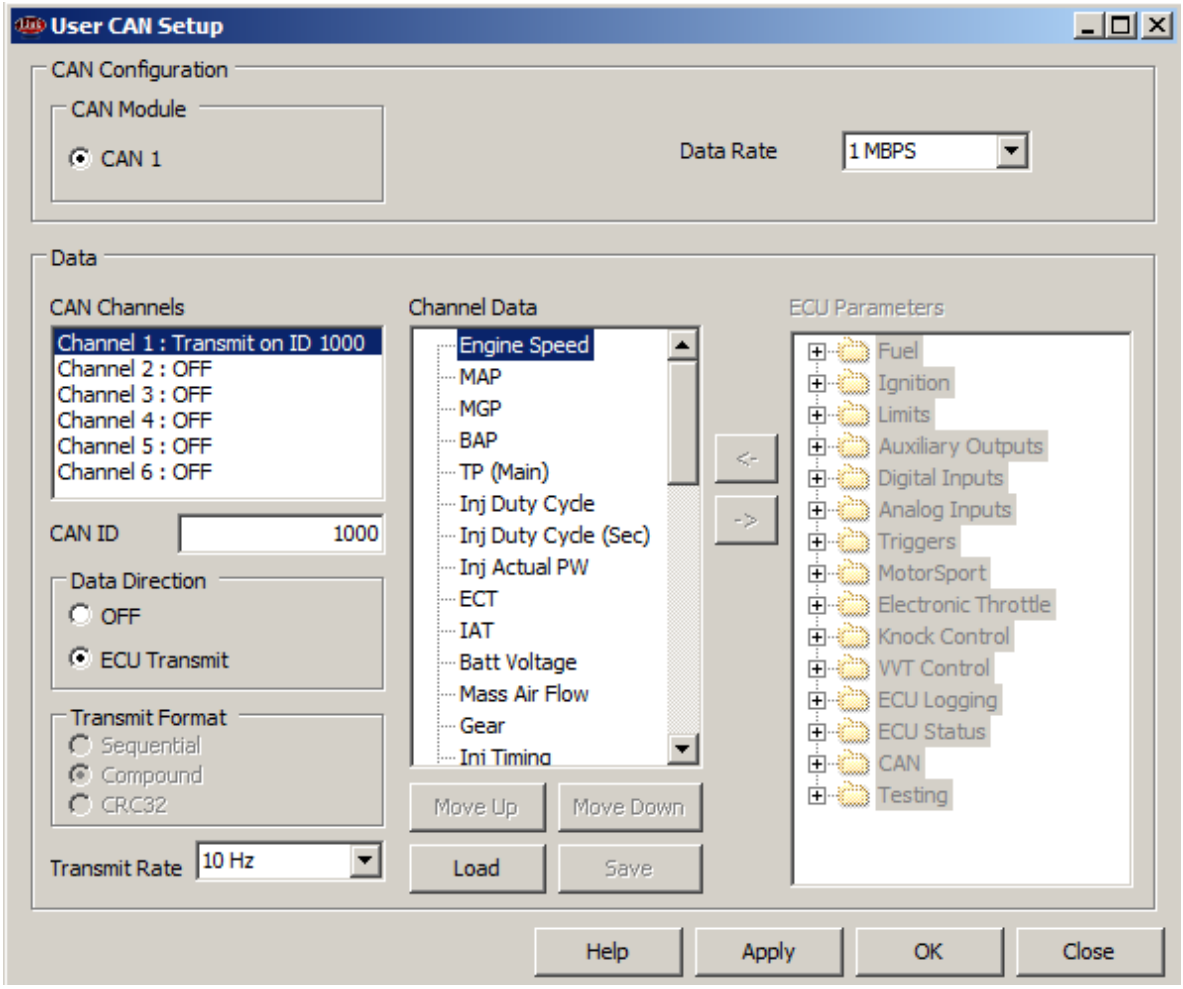
15. Figure – PCLink PrintScreen_2

Click on **Load** button. The following screen will open:



16. Figure – PCLink PrintScreen_3

Choose in your PCLink G4 / CAN library: **Generic Dash.lcc** and click **Open**.



17. Figure – PCLink PrintScreen_4

Here you should set the Data Rate, Transmit Rate.
Recommended setting:
Data Rate: 1 MBPS

Click **OK**.

Data from Link Engine Management System:

Parameter	Description	Unit	Range
Engine Speed	Motor rpm	RPM	0 - 15000 RPM
MAP	Manifold Absolute Pressure	kPa	0 - 650 kPa
MGP	Manifold Gauge Pressure	kPa	-100 - 550 kPa
BAP	Barometric Pressure	kPa	0 - 200 kPa
TP (Main)	Throttle Position	%	0-100%
Inj Duty Cycle	Injection Duty Cycle	%	0-100 %

Inj Duty Cycle (Sec)	Injection Duty Cycle	%	0 - 100%
Inj Actual PW	Injector Pulse Width	ms	0 - 65 ms
ECT	Engine Temp Correction	°C	-50 - 205 °C
IAT	Intake Air Temperature	°C	-20 - 205 °C
Batt Voltage	ECU Volts	V	0 - 65 V
Mass Air Flow	Mass Air Flow	L/Hr x 10	0 - 6500 g/s
Gear	Gear Position	-	0 - 6
Inj Timing	Injector Timing	deg	0 - 719 deg
Ign Angle	Ignition Timing	deg	-100 - 100 deg
Inlet / LH Posn	Cam Inlet Position L	deg	0 - 60 deg
Inlet RH Posn	Cam Inlet Position R	deg	0 - 60 deg
Exh RH Posn	Cam Exhaust Position R	deg	-60 - 0 deg
WideBand 1	Lambda Sensor	AFR	0 - 65 AFR
WideBand 2	Lambda Sensor	AFR	0 - 65 AFR
Trig 1 Err Counter	Trig 1 Error Counter	-	0 - 255
Fault Codes	Fault Codes	-	0 - 255
Fuel Pressure	Fuel Pressure	kPa	0 - 6550 kPa
Oil Temp	Oil Temperature	°C	-50 - 205 °C
Oil Pressure	Oil Pressure	kPa	0 - 6550 kPa
Speed (DI #1)	Speed 1	kph	0 - 1000 kph
Speed (DI #2)	Speed 2	kph	0 - 1000 kph
Speed (DI #3)	Speed 3	kph	0 - 1000 kph
Speed (DI #4)	Speed 4	kph	0 - 1000 kph
Knk Level Cyl 1	Knock Sensor 1	units	0 - 1000 units
Knk Level Cyl 2	Knock Sensor 2	units	0 - 1000 units
Knk Level Cyl 3	Knock Sensor 3	units	0 - 1000 units
Knk Level Cyl 4	Knock Sensor 4	units	0 - 1000 units
Knk Level Cyl 5	Knock Sensor 5	units	0 - 1000 units
Knk Level Cyl 6	Knock Sensor 6	units	0 - 1000 units
Knk Level Cyl 7	Knock Sensor 7	units	0 - 1000 units
Knk Level Cyl 8	Knock Sensor 8	units	0 - 1000 units
Limits Flags Words	Limits Flags Words*	-	0 - 65536

*See 6. Table

5. Table - Link parameters

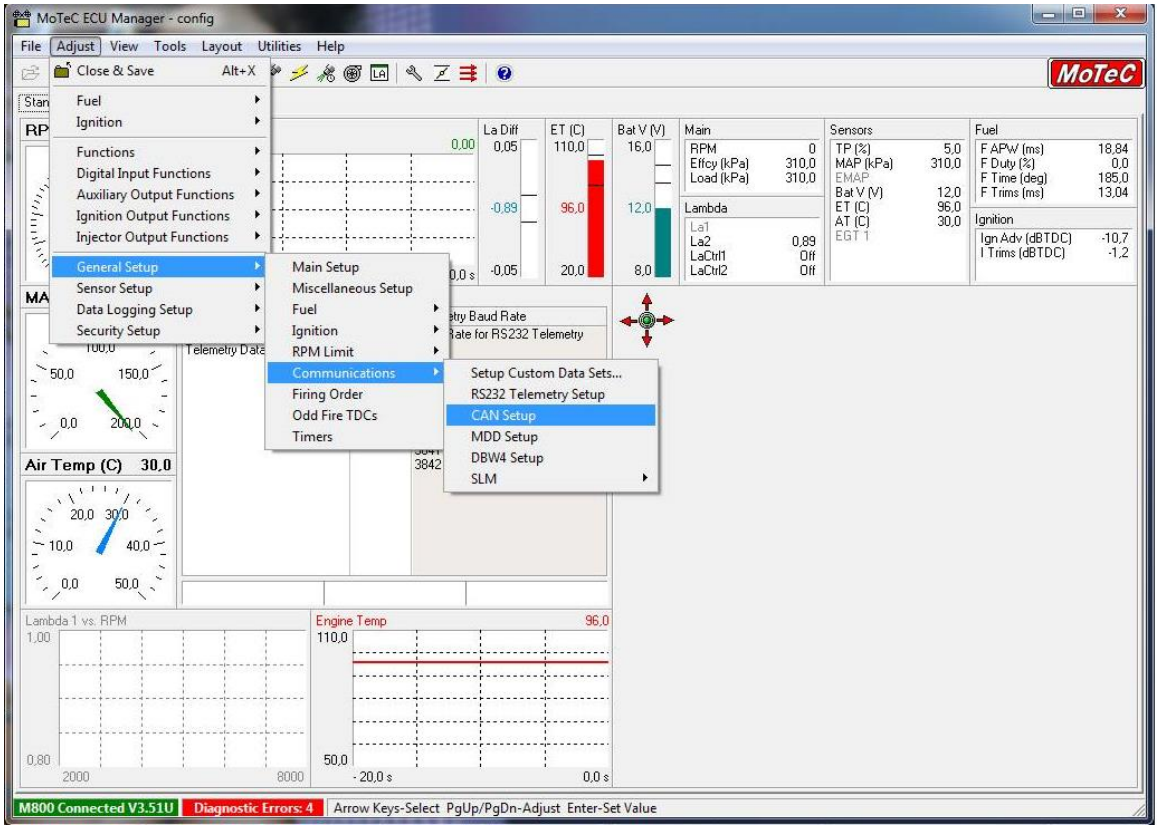
Bit	Description
0	RPM Limit
1	MAP Limit
2	Speed Limit
3	Maximum Ignition Flag
4	Anti-lag Ignition Cut
5	High Supply Voltage Limit
6	Overrun Flag
7	Traction Limit
8	Low Supply Voltage Flag
9	Launch RPM Limit
10	Wakeup Flag
11	GP RPM Limit 1
12	CL Stepper Limit
13	GP RPM Limit 2
14	EThrottle Limit
15	Cyclic Idle Active

6. Table - Limits Flags Definition

5.3. MoTeC

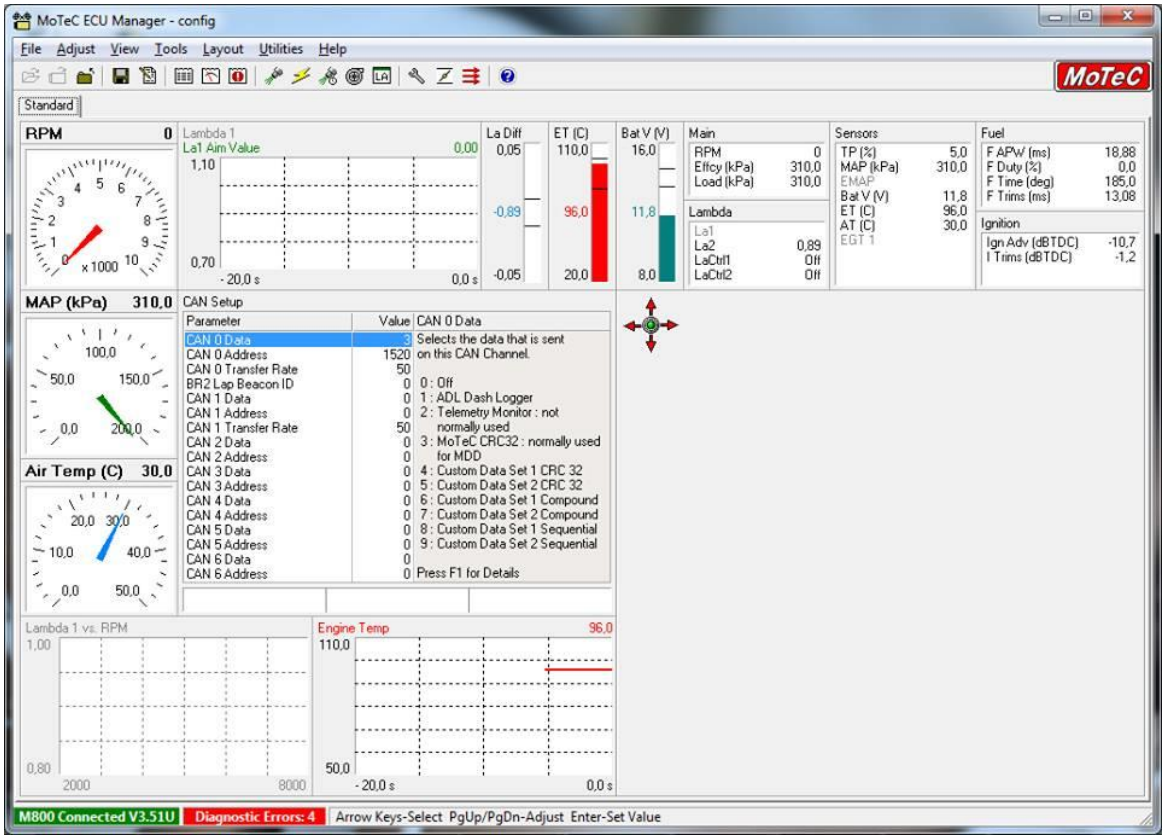
5.3.1. MoTeC M800 and other MoTeC ECUs with CRC32 protocol

In order to operate your motor controller properly with the RDC display, you have to make the following settings in the MoTeC ECU Manager software.



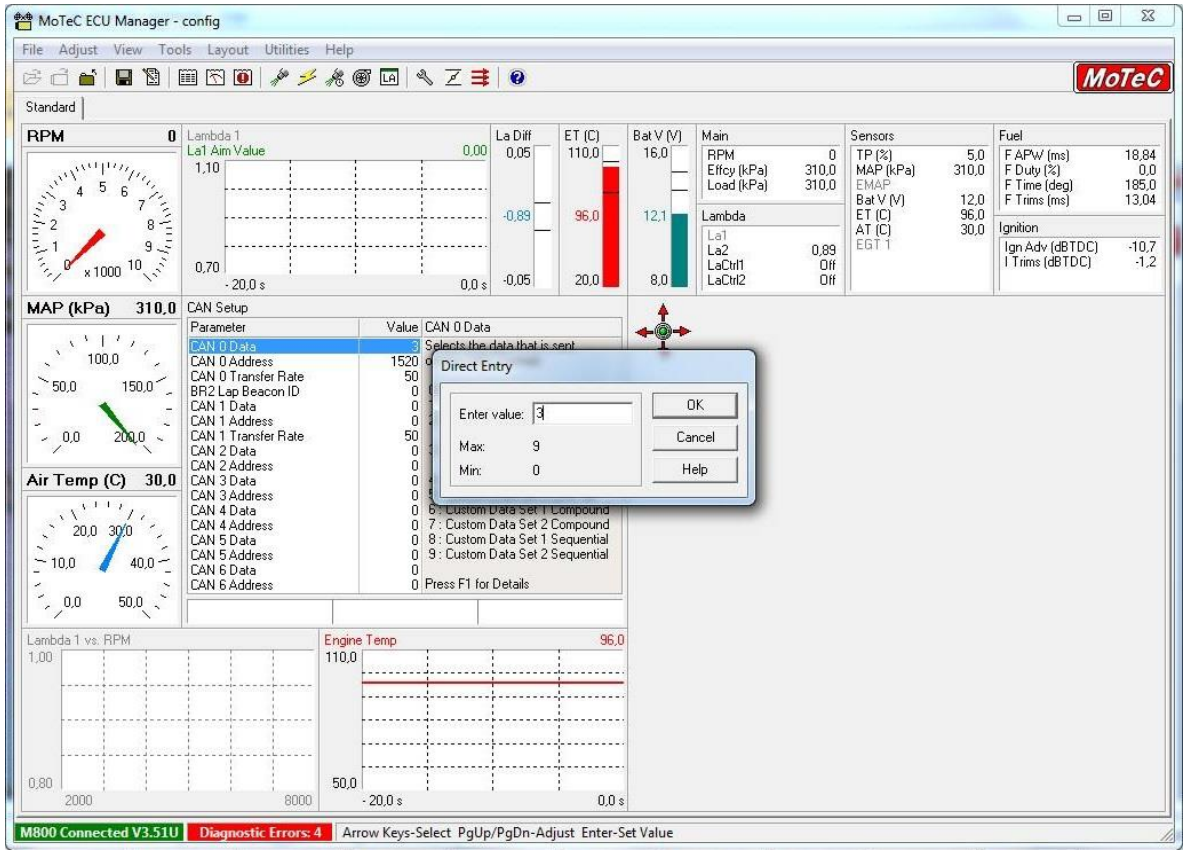
18. Figure – MoTeC ECU Manager PrintScreen_1

Open **Adjust → General Setup → Communications → CAN Setup**.
The following screen will appear:



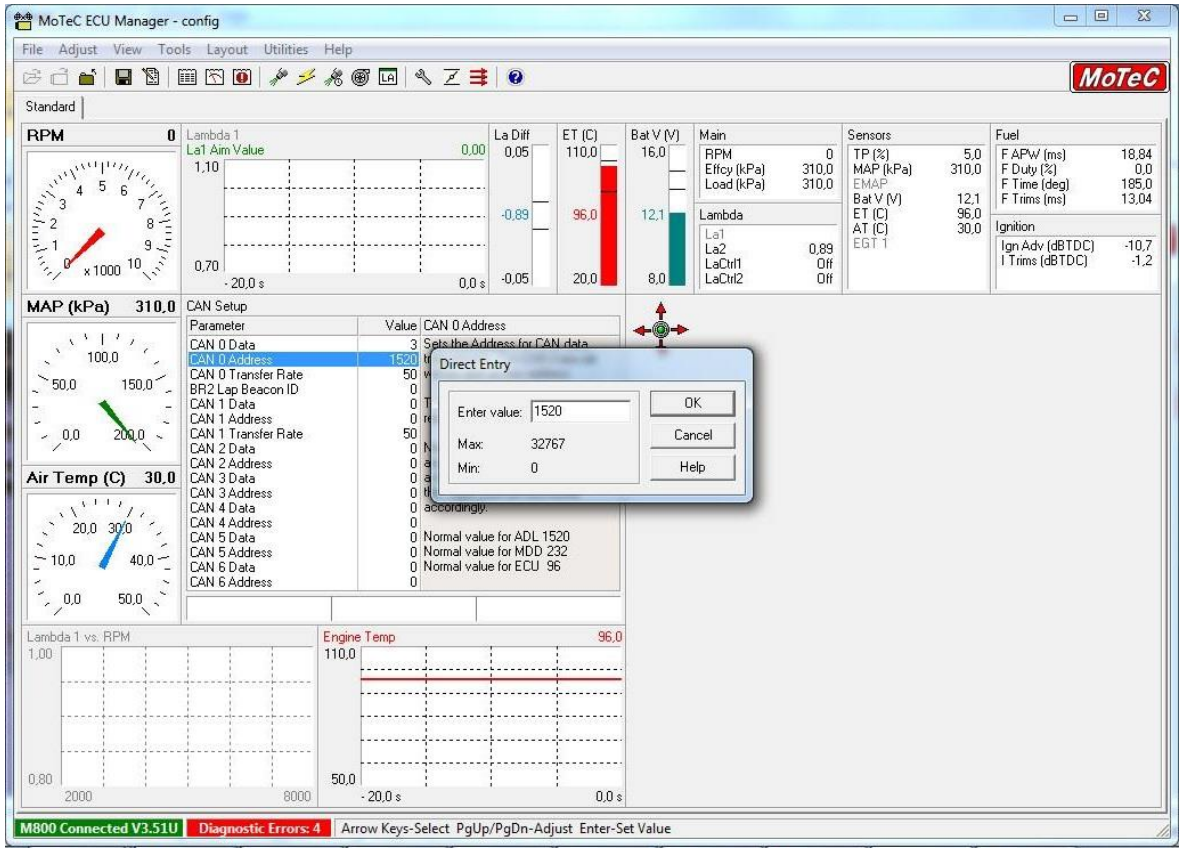
19. Figure - MoTeC ECU Manager PrintScreen_2

There you must set three parameters: **CAN 0 Data**, **CAN 0 Address** and **CAN 0 Transfer Rate**.



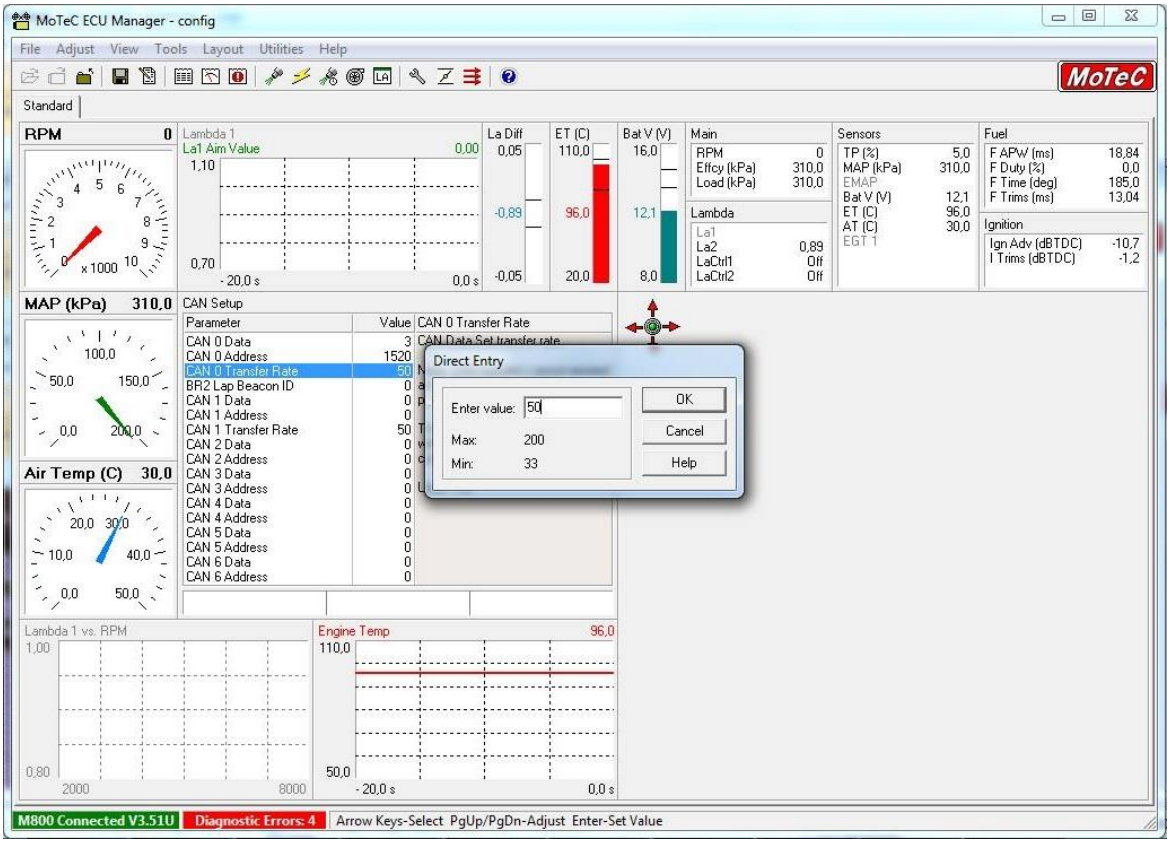
20. Figure - MoTeC ECU Manager PrintScreen_3

Set CAN 0 Data to 3, and press **OK**.



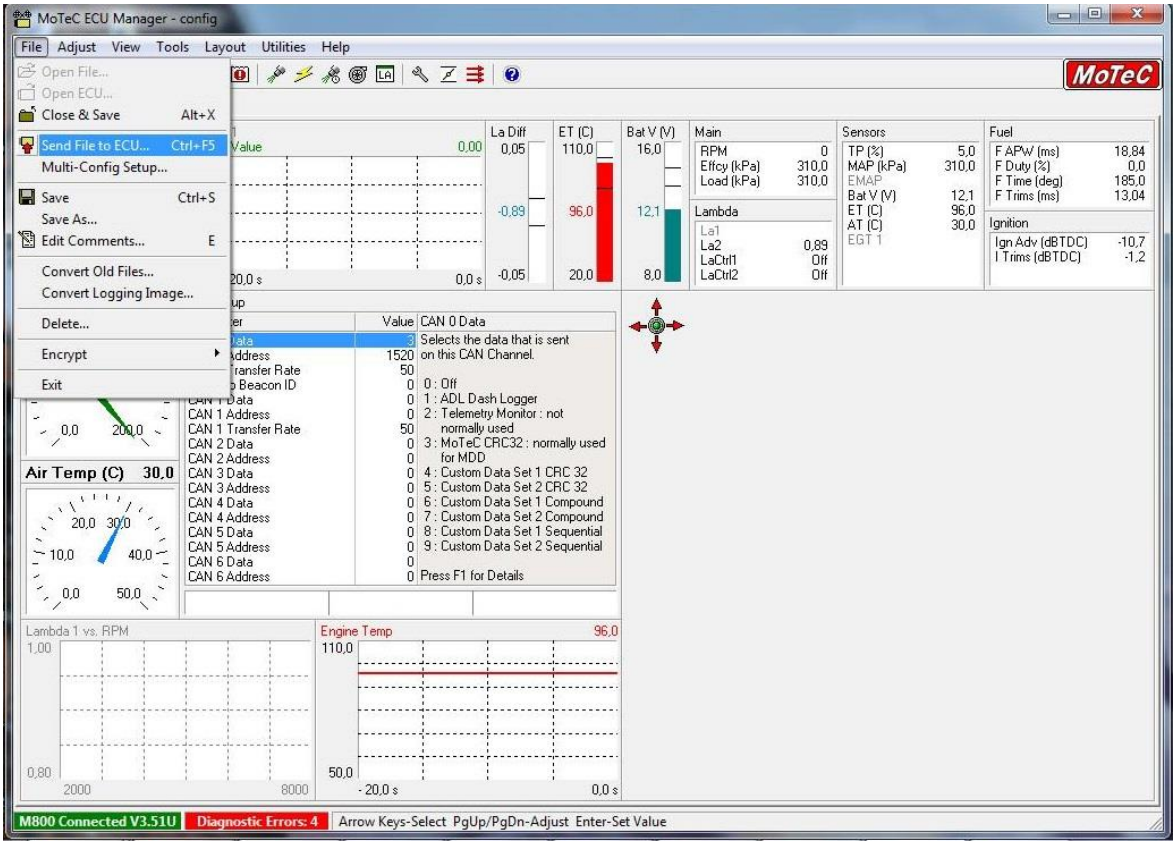
21. Figure - MoTeC ECU Manager PrintScreen_4

Set CAN 0 Adress to 1520, and press **OK.**



22. Figure - MoTeC ECU Manager PrintScreen_5

Set CAN 0 Transfer Rate to 50, and press **OK**.



23. Figure - MoTeC ECU Manager PrintScreen_6

After the configuration, select **File → Send File to Ecu...**.

Name	Value / Scaling
Header 0	$82
Header 1	$81
Header 2	$80
Data Length	1 – 255 Channels (currently 84)
RPM	1RPM
Throttle Position	0.1%
Manifold Pressure	0.1kPa
Air Temperature	0.1C
Engine Temperature	0.1C
Lambda 1	0.001La
Lambda 2	0.001La
Exhaust Manifold Pressure	0.1kPa
Mass Air Flow	0.1*
Fuel Temperature	0.1C
Fuel Pressure	0.1kPa
Oil Temperature	0.1C
Oil Pressure	0.1kPa
Gear Voltage	0.01V

Knock Voltage	0.01V
Gear Shift Force	0.1kg
Exhaust Temperature 1	1C
Exhaust Temperature 2	1C
User Channel 1	0.1*
User Channel 2	0.1*
User Channel 3	0.1*
User Channel 4	0.1*
Battery Voltage	0.01V
ECU Temperature	0.1C
Digital Input 1 Speed	0.1km/h
Digital Input 2 Speed	0.1km/h
Digital Input 3 Speed	0.1km/h
Digital Input 4 Speed	0.1km/h
Drive Speed	0.1km/h
Ground Speed	0.1km/h
Slip	0.1km/h
Aim Slip	0.1km/h
Launch RPM	1RPM
Lambda 1 short term trim	0.1%
Lambda 2 short term trim	0.1%
Lambda 1 long term trim	0.1%
Lambda 2 long term trim	0.1%
Aim Lambda 1	0.001La
Aim Lambda 2	0.001La
Fuel Cut Level	*100/255 = 0.1%
Ignition Cut Level	*100/255 = 0.1%
Ignition Advance	0.1dBTDC
Load Point	0.1
Efficiency Point	0.1
Fuel Used	1*
Auxiliary O/P 1 Duty Cycle	1%
Auxiliary O/P 2 Duty Cycle	1%
Auxiliary O/P 3 Duty Cycle	1%
Auxiliary O/P 4 Duty Cycle	1%
Auxiliary O/P 5 Duty Cycle	1%
Auxiliary O/P 6 Duty Cycle	1%
Auxiliary O/P 7 Duty Cycle	1%
Auxiliary O/P 8 Duty Cycle	1%
Fuel Actual Pulse Width	0.5 µs
Fuel Effective Pulse Width	0.5 µs
Fuel Injector Duty Cycle	0.1%
Gear	/10 = gear
Sync Position	0.1%

Fuel Comp 1	0.1%	
Fuel Comp 2	0.1%	
Diagnostic Error Group 1	TP_ERR	1
	MAP_ERR	2
	AT_ERR	4
	ET_ERR	8
	LA1_ERR	16
	LA2_ERR	32
	EMAP_ERR	64
	MAF_ERR	128
Diagnostic Error Group 2	BARO_ERR	1
	FT_ERR	2
	FP_ERR	4
	OT_ERR	8
	OP_ERR	16
	LAT_G_ERR	32
	LONG_G_ERR	64
	SLIP_V_ERR	128
Diagnostic Error Group 3	GEAR_V_ERR	1
	KNOCK_ERR	2
	EGT1_ERR	4
	EGT2_ERR	8
	USER1_ERR	16
	USER2_ERR	32
	USER3_ERR	64
	USER4_ERR	128
Diagnostic Error Group 4	BATV_ERR	1
	ECUT_ERR	2
	VERT_G_ERR	4
	GEAR_FORCE_ERR	8
	DBW_CONT	16
	DBW_ERR	32
	DBW_AIM	64
	DBW_FB	128
Diagnostic Error Group 5	-	
Diagnostic Error Group 6	LOW_BAT_ERR	1
	OVER_BOOST_ERR	2
	NO_SYNC_ERR	4
	SYNC_ERR	8
	NO_REF_ERR	16
	REF_ERR	32
	RPM_OVER_ERR	64

	F_MAX_DTY_ERR	128
Diagnostic Error Group 7	MEM_ERR	1
	DELTA_BAT	2
	LA1_HEATER_ERR	4
	LA2_HEATER_ERR	8
	LA1_OT	16
	LA2_OT	32
	LA1_SENS_ERR	64
	LA2_SENS_ERR	128
Diagnostic Error Group 8	-	
Diagnostic Error Group 9	RESET_TESTMOD	1
	RESET_SYS	2
	RESET_NOXTAL	4
	-	8
	RESET_HALTMON	16
	-	32
	-	64
	RESET_EXT	128
Diagnostic Error Group 10	INJ1_ERR	1
	INJ2_ERR	2
	INJ3_ERR	4
	INJ4_ERR	8
	INJ5_ERR	16
	INJ6_ERR	32
	INJ7_ERR	64
	INJ8_ERR	128
Diagnostic Error Group 11	INJ1_SHORT	1
	INJ2_SHORT	2
	INJ3_SHORT	4
	INJ4_SHORT	8
	INJ5_SHORT	16
	INJ6_SHORT	32
	INJ7_SHORT	64
	INJ8_SHORT	128
Diagnostic Error Group 12	INJ1_OPEN	1
	INJ2_OPEN	2
	INJ3_OPEN	4
	INJ4_OPEN	8
	INJ5_OPEN	16
	INJ6_OPEN	32
	INJ7_OPEN	64
	INJ8_OPEN	128
Diagnostic Error Group 13	INJ1_PEAK	1

	INJ2_PEAK	2
	INJ3_PEAK	4
	INJ4_PEAK	8
	INJ5_PEAK	16
	INJ6_PEAK	32
	INJ7_PEAK	64
	INJ8_PEAK	128
Diagnostic Error Group 14	SYNC_LOW	1
	SYNC_RNT	2
	SYNC_TRIG	4
	SYNC_ARM	8
	REF_LOW	16
	REF_RNT	32
	REF_TRIG	64
	REF_ARM	128
Diagnostic Error Group 15	-	
Diagnostic Error Group 16	-	
Status Flags Group 1	RPM Limit Exceeded	1
	Launch Control	2
	Gear Change Ign Cut	4
	REF/SYNC Synched	8
	Closed Loop La 2	16
	Closed Loop La 1	32
	Lambda 2 Cold	64
	Lambda 1 Cold	128
Status Flags Group 2	Overrun Boost	1
	Alternator Off	2
	Overrun Fuel Cut	4
	-	8
	-	16
	-	32
	-	64
	-	128
Status Flags Group 3	Digital Input 1	1
	Digital Input 2	2
	Digital Input 3	4
	Digital Input 4	8
	-	16
	Nitrous	32

	Air Con Request	64
	Dual RPM Limit	128
Status Flags Group 4	Traction Ctrl Disable	1
	Clutch	2
	Logging Enable	4
	Beacon Mark	8
	Overrun Boost Enable	16
	Gear Chg Cut Request	32
	Ignition Switch	64
	Brake	128
Status Flags Group 5	-	1
	-	2
	Spray Bar	4
	-	8
	-	16
	Telemetry Control	32
	Power Steer OvLd	64
	Ground Speed Limit	128
Status Flags Group 6	-	
Status Flags Group 7	Digital Input 5	1
	Digital Input 6	2
	Digital Input 7	4
	Digital Input 8	8
	Digital Input 9	16
	Digital Input 10	32
	-	64
	-	128
Status Flags Group 8	-	
CRC byte 1 (HI Byte)		
CRC byte 2		
CRC byte 3		
CRC byte 4 (LO Byte)		

7. Table – Protocol Description

5.3.2. MoTeC M4

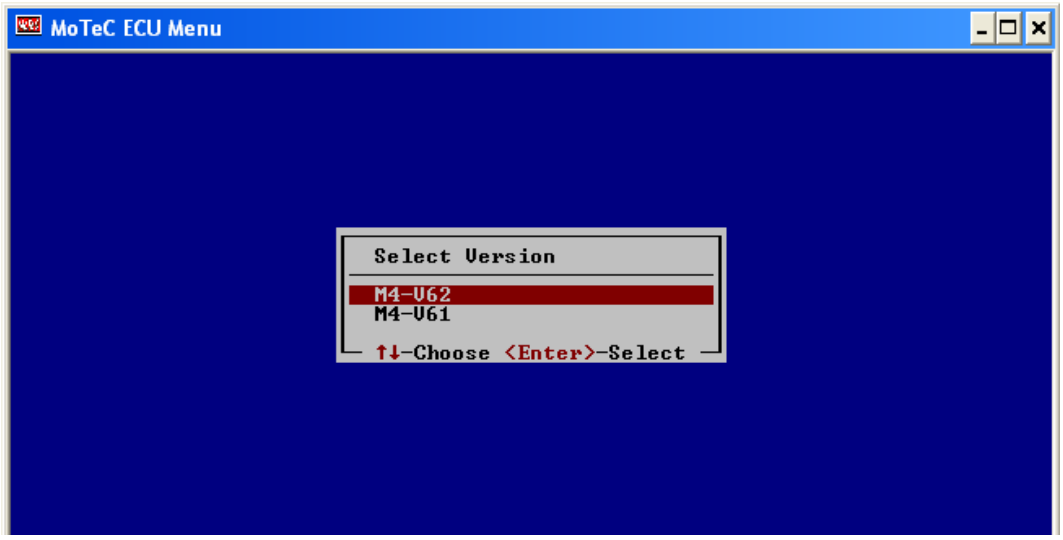
First of all, the wiring of the MoTeC M4 ECU is different from any other ECUs.
The differences:

Motec M4 pin	**RCD Display**
Pin 21 (TxD)	Main Connector 2, pin. No. 10

Pin 22 (RxD)	Main Connector 2, pin. No. 11
Pin 23 (DTR)	Main Connector 2, pin. No. 12

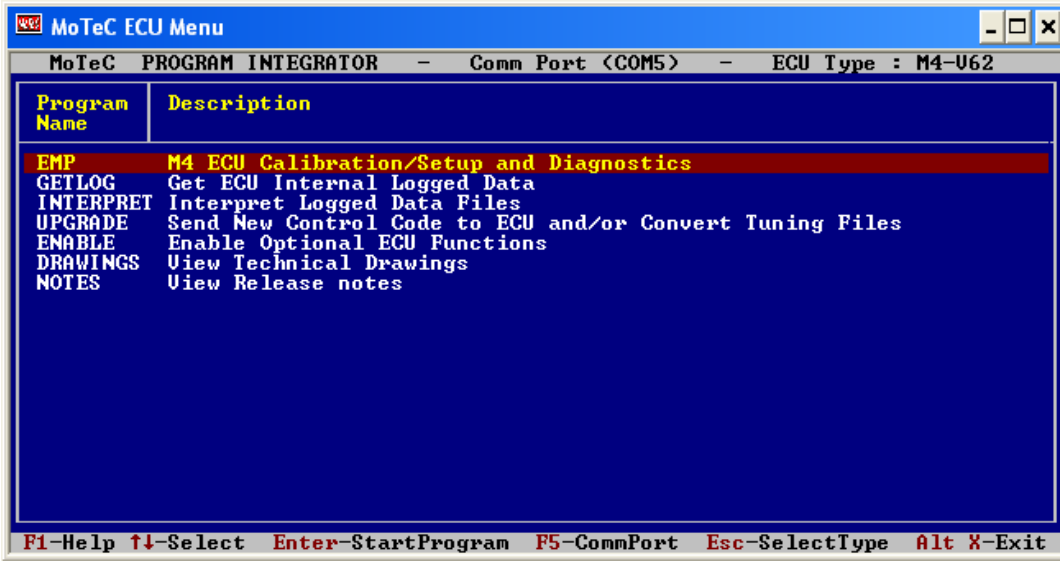
Connection of the other wires are the same as they are listed in the **4.1. Connectors** chapter.

In order to operate your motor controller properly with the RDC display, you have to make the following settings in the MoTeC ECU Manager software:



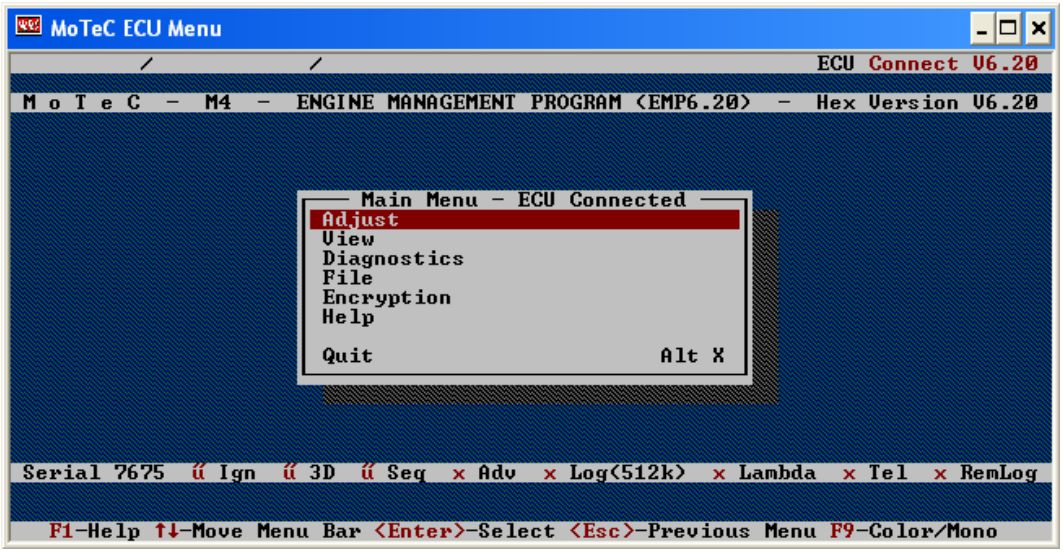
24. Figure – MoTeC M4 PrintScreen_1

As a first step, you shoul choose your MoTeC M4 version.



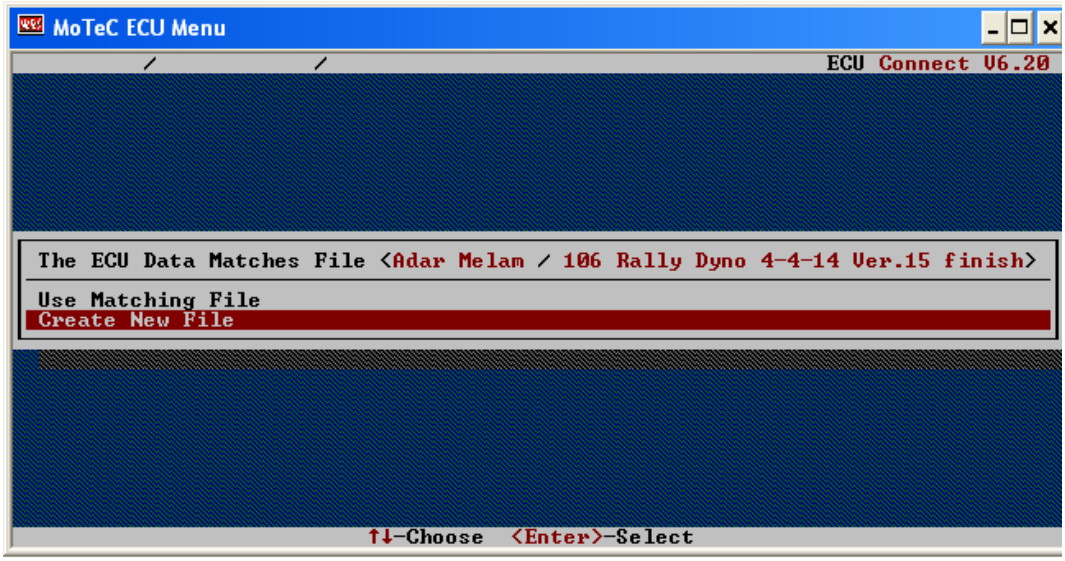
25. Figure - MoTeC M4 PrintScreen_2

Now select the program **EMP.**



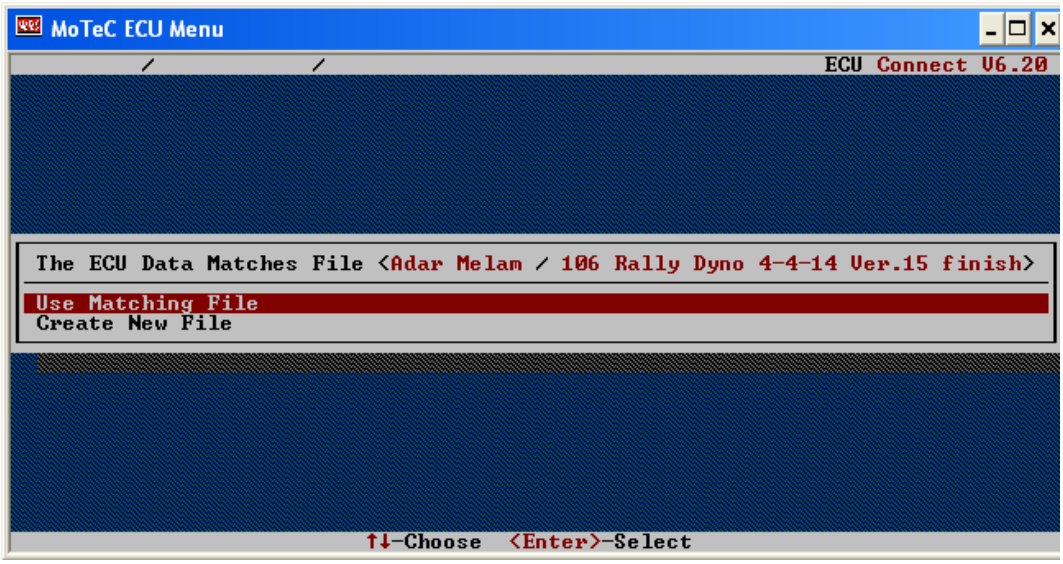
26. Figure - MoTeC M4 PrintScreen_3

Click on **Adjust.**



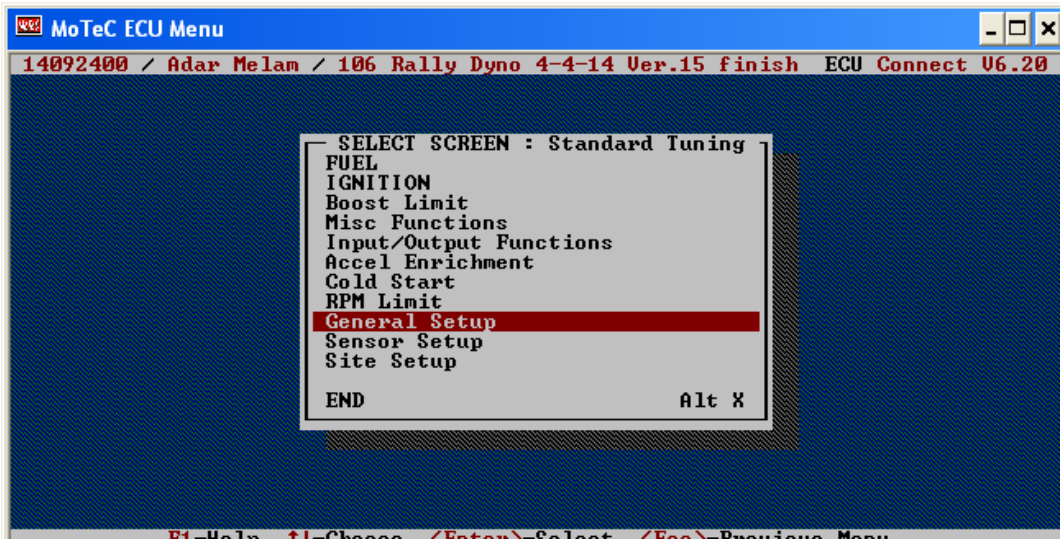
27. Figure - MoTeC M4 PrintScreen_4

If you connect the ECU to the computer for the first type, select the **Create New File** option. Next time when you connect your ECU, it will find this file on your computer.



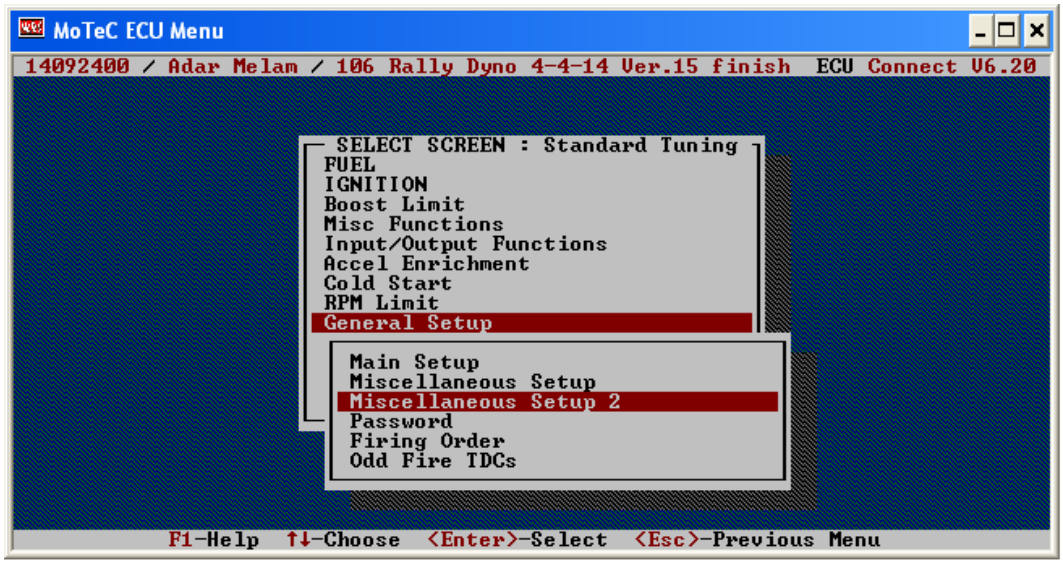
28. Figure - MoTeC M4 PrintScreen_5

If it is at least the second time when you connect your MoTeC M4 ECU to the computer, it will found the last version of you file, so click on **Use Matching File.**



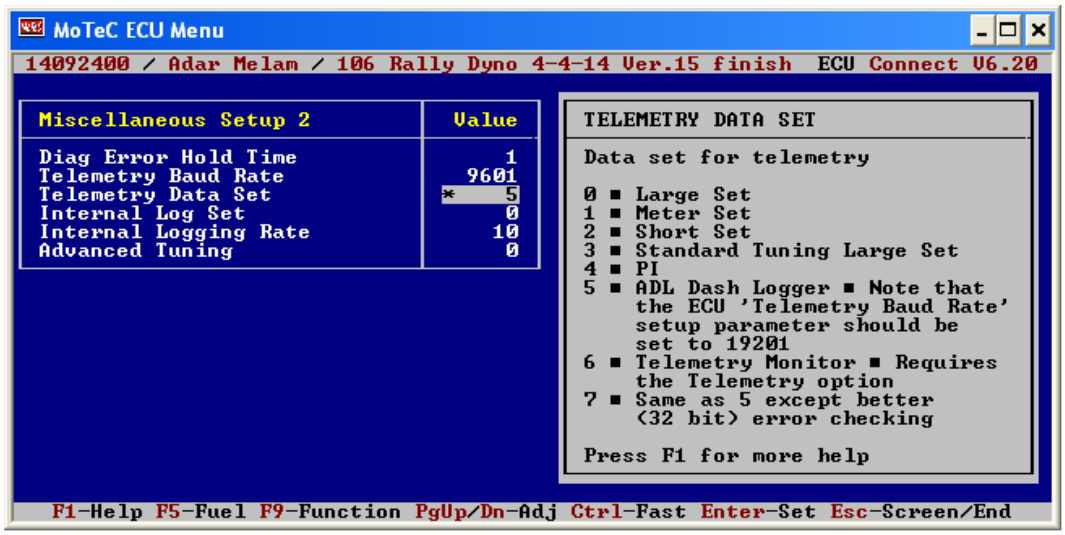
29. Figure - MoTeC M4 PrintScreen_6

Now select **General Setup** menu**.**



30. Figure - MoTeC M4 PrintScreen_7

In the General Setup menu, select **Miscellaneous Setup 2.**



31. Figure - MoTeC M4 PrintScreen_8

In Miscellaneous Setup 2, you should only change the value of **Telemetry Data Set.** Set it to **5.**
You should also set the **Telemetry Baud Rate** in this menu. The value of the baud rate should be **19200**.

Name	Value / Scaling
RPM	1RPM
Throttle Position	1%
Manifold Pressure	1kPa
Air Temperature	1C
Engine Temperature	1C
Lambda 1	0.01La

Aux Temperature	0,1*	
Aux Voltage	0,1*	
Battery Voltage	0.1V	
ECU Temperature	0.1C	
Barometric Pressure	0,1kPa	
Digital Input 1 Speed	0.1km/h	
Digital Input 2 Speed	0.1km/h	
Ground Speed	0.1km/h	
Drive Speed	0.1km/h	
Slip	0.1km/h	
Gear	/10 = gear	
Load Point	0.1	
Efficiency Point	0.1	
Efficiency 2 Point	0.1	
Fuel Used	0.01L	
Auxiliary O/P 1 Duty Cycle	0,1%	
Auxiliary O/P 2 Duty Cycle	0,1%	
Auxiliary O/P 3 Duty Cycle	0,1%	
Auxiliary O/P 4 Duty Cycle	0,1%	
Lambda short term trim	0.1%	
Lambda long term trim	0.1%	
Fuel Actual Pulse Width	1 µs	
Fuel Effective Pulse Width	1 µs	
Fuel Injector Duty Cycle	0.1%	
Fuel Acceleration Enrichment	1 µs	
Ignition Cut Level	0.1%	
Fuel Cut Level	0.1%	
Diagnostic Error Group 1	TP_ERR	1
	MAP_ERR	2
	AT_ERR	4
	ET_ERR	8
	BAT_ERR	16
	LA_ERR	32
	AUXV_ERR	64
	AUXT_ERR	128
Ignition Advance	0,1 dBTDC	
Sync position	1%	
Fuel Aux Temp Comp	0,1%	
Fuel Aux Volt Comp	0,1%	

8. Table - Protocol Description of MoTeC M4 ECU

Diagnostic Error Group2	ECUT_ERR	1
	DELTA_BAT	2

	-	4
	-	8
	-	16
	-	32
	AUXV_DP	64
	AUXT_DP	128
Diagnostic Error Group 3	INJ1_ERR	1
	INJ2_ERR	2
	INJ3_ERR	4
	INJ4_ERR	8
	-	16
	-	32
	-	64
	-	128
Diagnostic Error Group 4	LOW_BAT_ERR	1
	OVER_BOOST_ERR	2
	NO_SYNC_ERR	4
	SYNC_ERR	8
	NO_REF_ERR	16
	REF_ERR	32
	RPM_OVER_ERR	64
	F_MAX_DTY_ERR	128
Diagnostic Error Group 5	MEMORY_ERR	1
	IN_GEAR_ERR	2
	INJ_SPRAY_ERR	4
	SPD1_DEC_ERR	8
	SPD2_DEC_ERR	16
	BRAKE	32
	DIG_IN1	64
	DIG_IN2	128

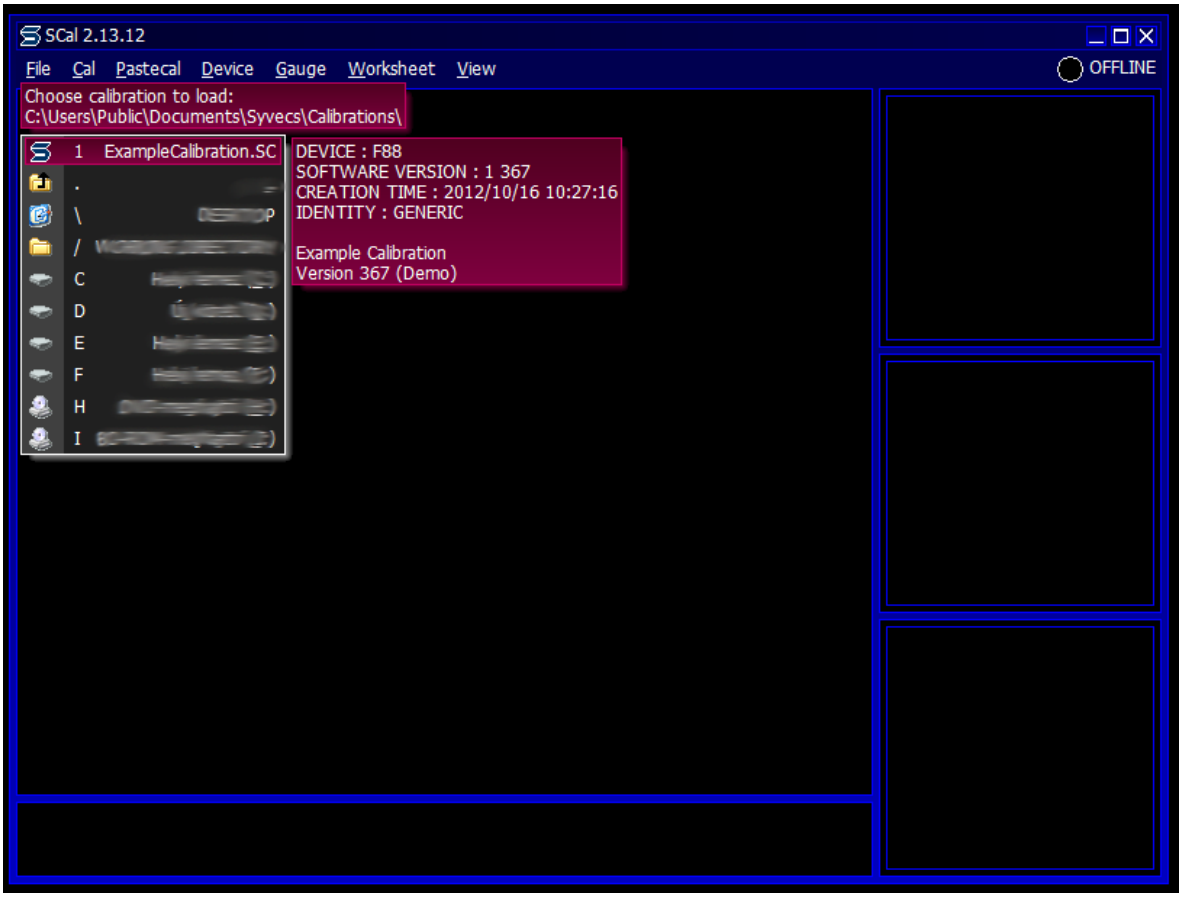
9. Table - Protocol Description of MoTeC M4 ECU – Diagnostic Error Groups

5.4. Syvecs

In order to operate your motor controller properly with the RDC display, you have to make the following settings in the SCal software.

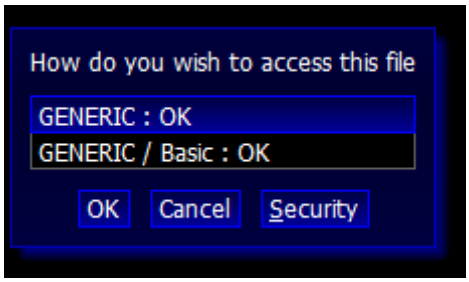
Before you open the SCal, make a backup save from your current *.sc file.
Now open the SCal, and load your current *.sc file by clicking on the **File** menu, **Load** button. Then select your file.

32. Figure – Scal PrintScreen_1



33. Figure - Scal PrintScreen_2

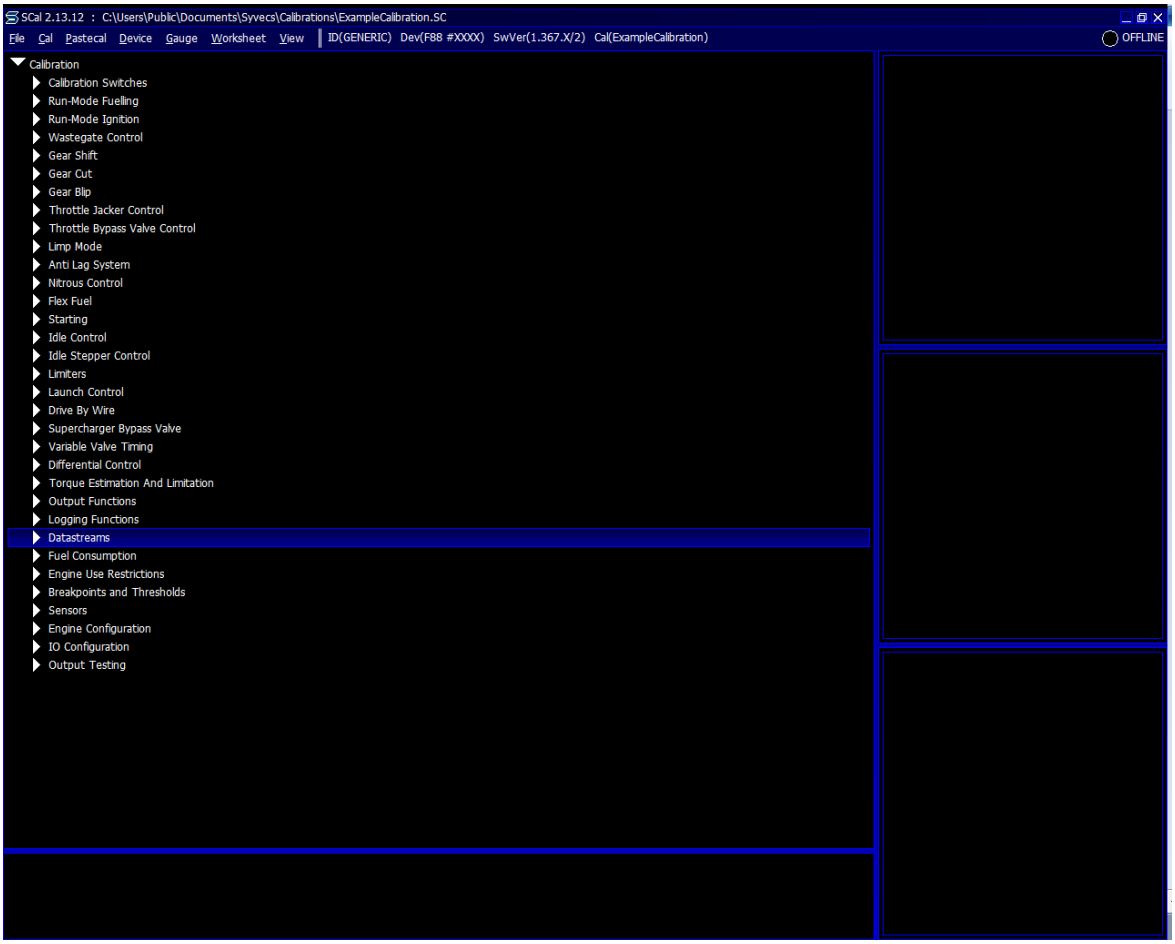
Download the Mechatromotive_RCD.sc file from our webpage. You can find it by clicking on the following buttons: **Products** -> **RCD Display** -> **Downloads.**
Now open the file in a new window with the Scal and in the pop-up window, choose GENERIC option. Don't close the other *.sc file!



34. Figure - Scal PrintScreen_3

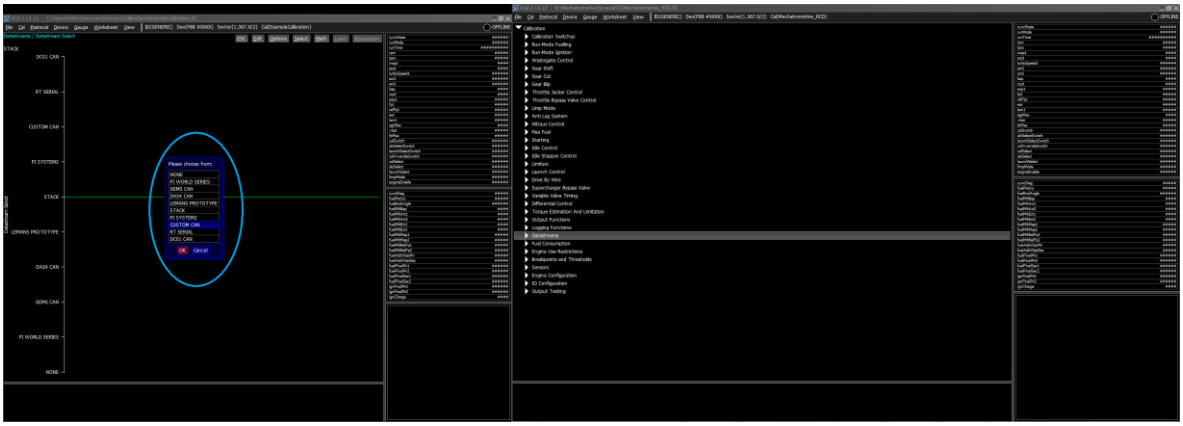
Some of the pictures will contain two windows. The left one is your current *.sc file, the right one is the Mechatromotive_RCD.sc file.

In the **Calibration** menu of your current *.sc file, click on **Datastreams** and inside this on **Datastream Select**.

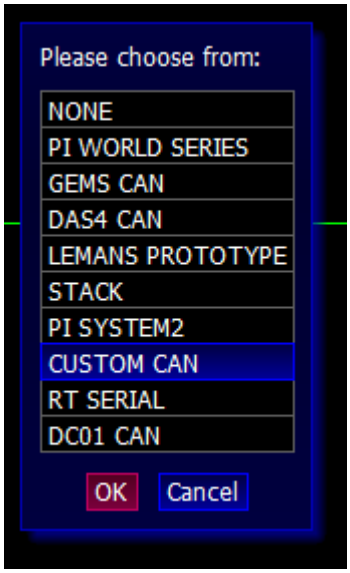


35. Figure - Scal PrintScreen_4

In the **Datasream Select** window, push the **0** button, then the following window will come up:



36. Figure - Scal PrintScreen_5

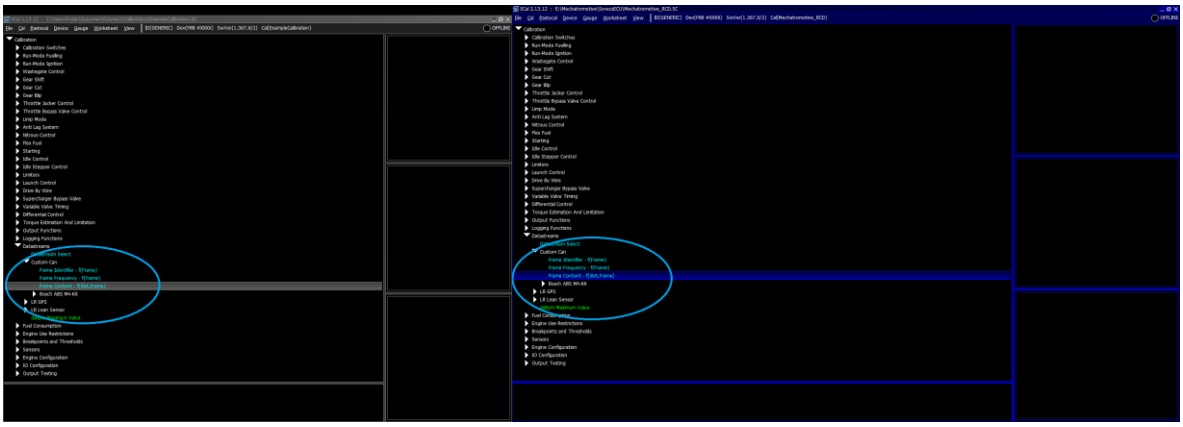


37. Figure - Scal PrintScreen_6

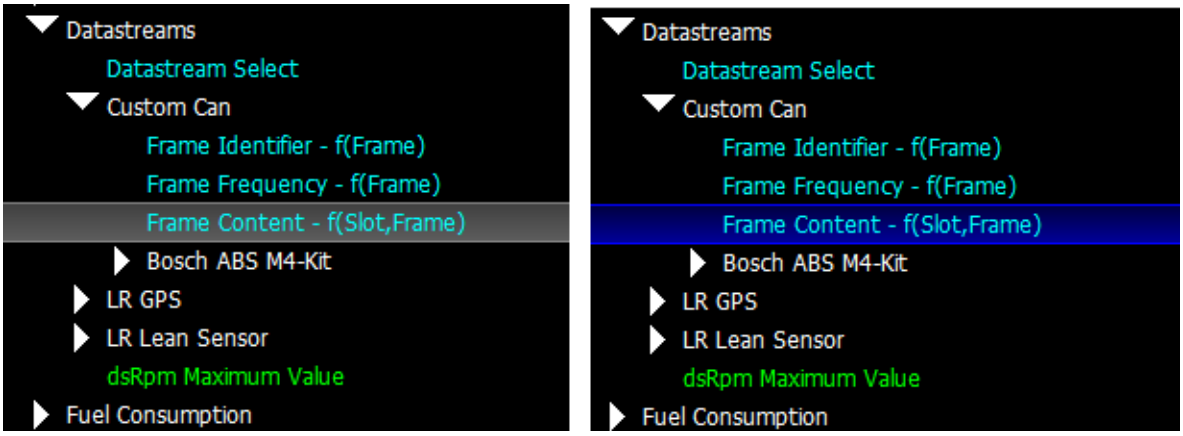
Select the **Custom CAN**, and click on the **OK** button.

Now you have to copy the values of Frame Identifier, Frame Frequency and Frame Content from the Mechatromotive_RCD.sc file to your current *.sc file.

For this, select **Datastreams → Custom CAN → Frame Content – f(Slot,Frame)** in both window**.**

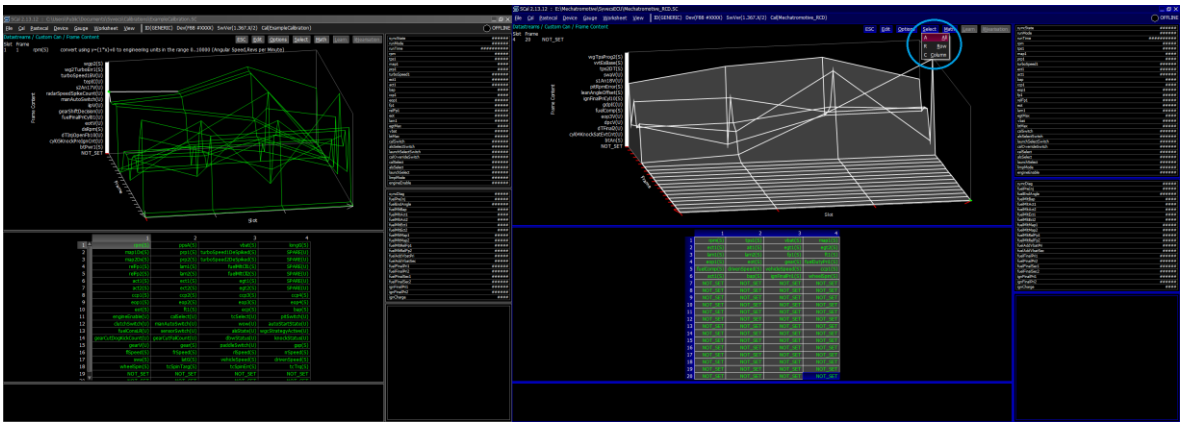


38. Figure - Scal PrintScreen_7

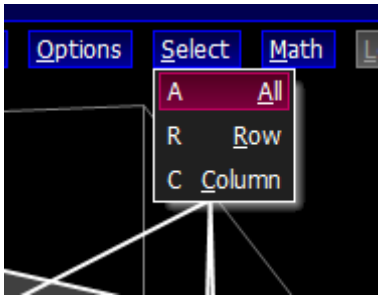


39. Figure - Scal PrintScreen_8

Now in the Mechatromotive_RCD.sc window click on **Select → All.**

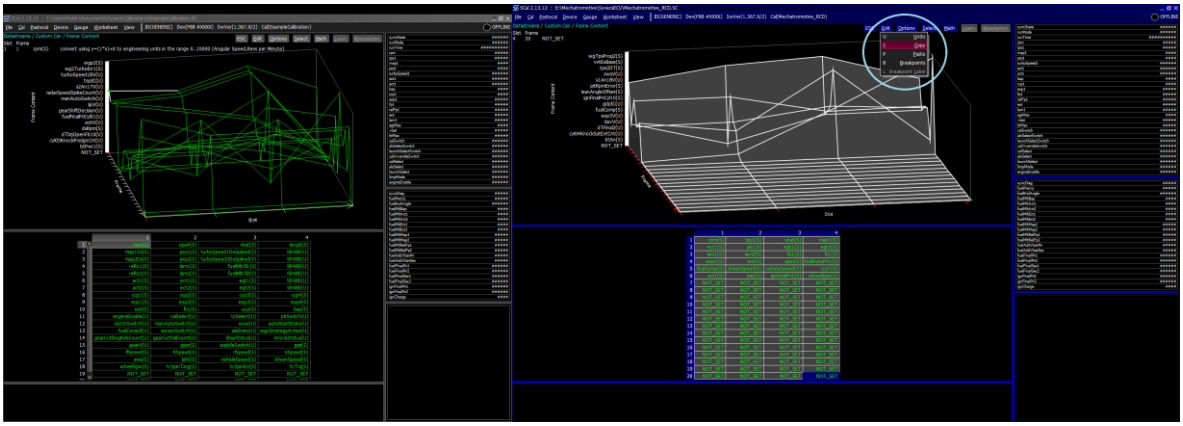


40. Figure - Scal PrintScreen_9

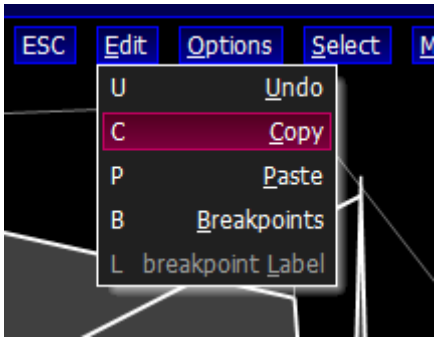


41. Figure - Scal PrintScreen_10

Now select **Edit → Copy,** still in the the Mechatromotive_RCD.sc window.

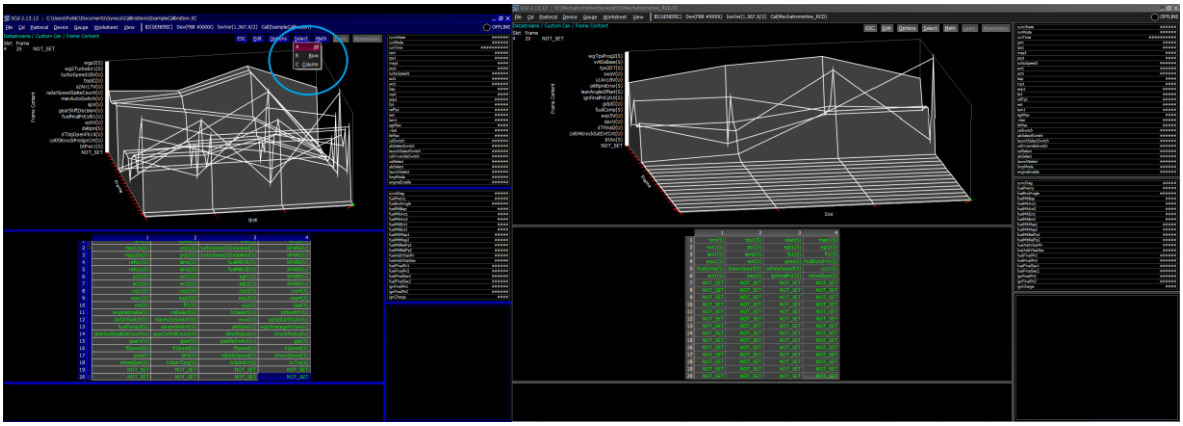


42. Figure - Scal PrintScreen_11

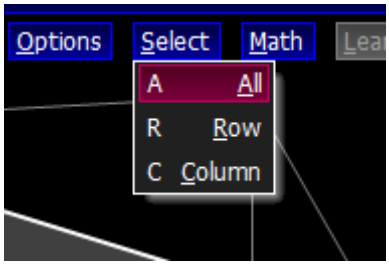


43. Figure - Scal PrintScreen_12

Now go to your current *.sc file. Click on **Select →All.**

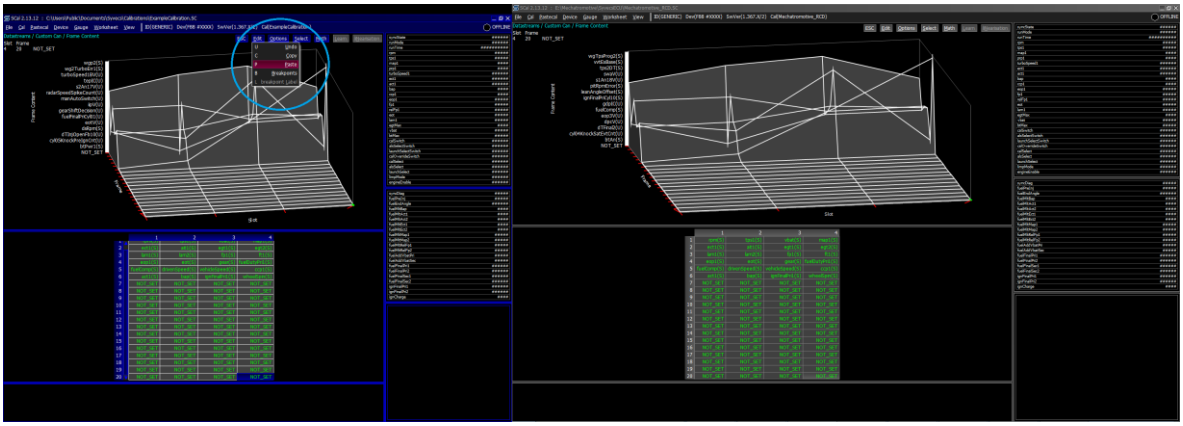


44. Figure - Scal PrintScreen_13

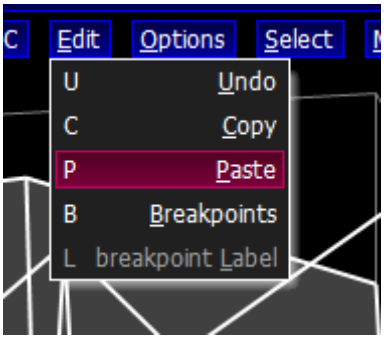


45. Figure - Scal PrintScreen_14

Click on **Edit → Paste,** still in your current *.sc file's window.



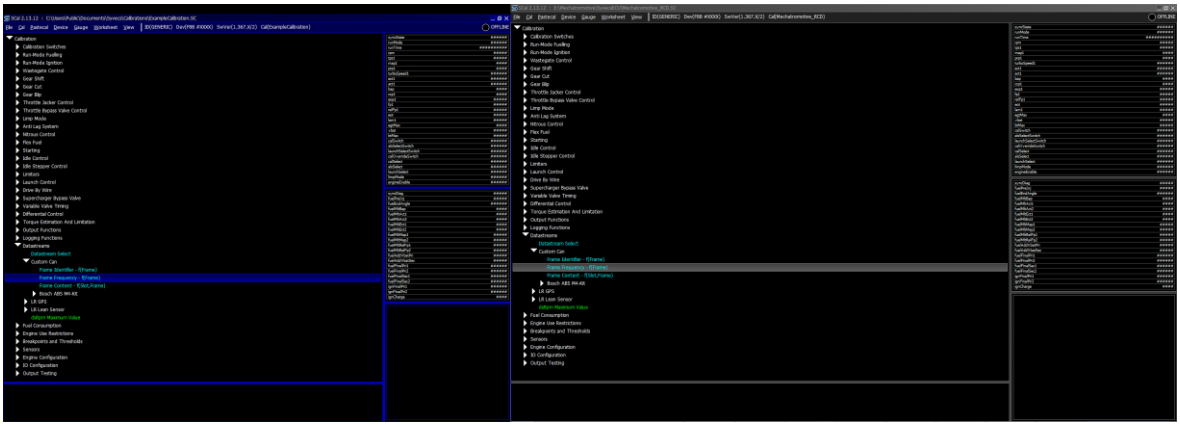
46. Figure - Scal PrintScreen_15



47. Figure - Scal PrintScreen_16

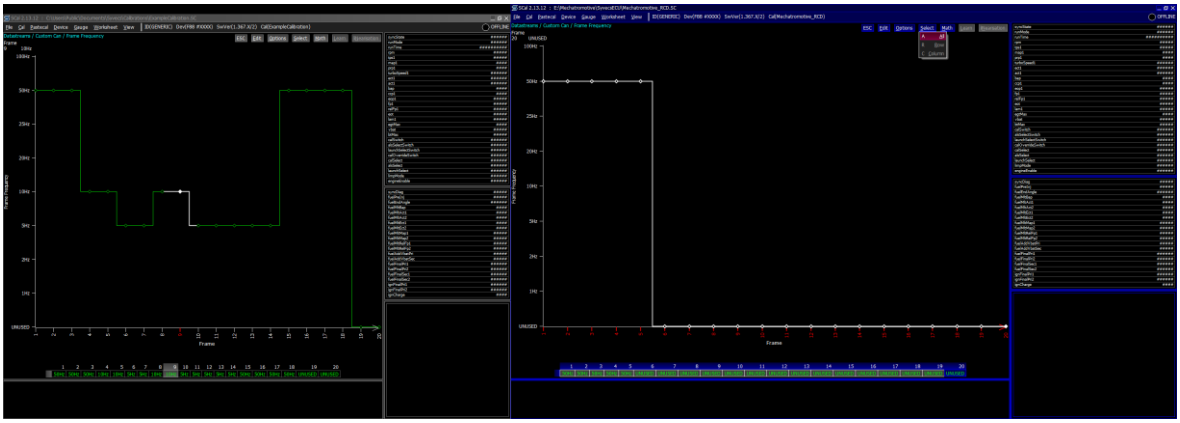
Now repeat the movements with the other parameters.

Select **Calibration → Datastreams → Custom CAN → Frame Frequency f(Frame).**



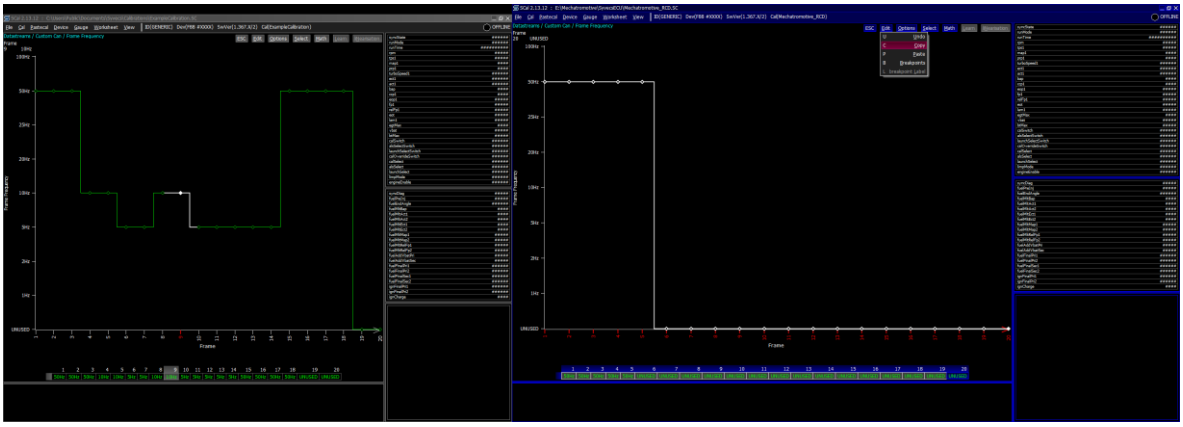
48. Figure - Scal PrintScreen_17

Now in the Mechatromotive_RCD.sc window click on **Select → All.**



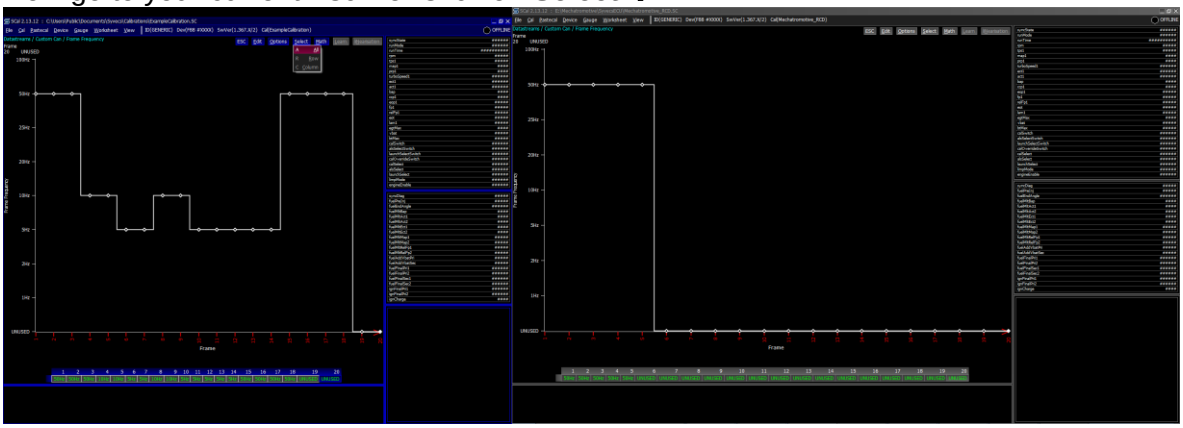
49. Figure - Scal PrintScreen_18

Now select **Edit → Copy,** still in the the Mechatromotive_RCD.sc window.



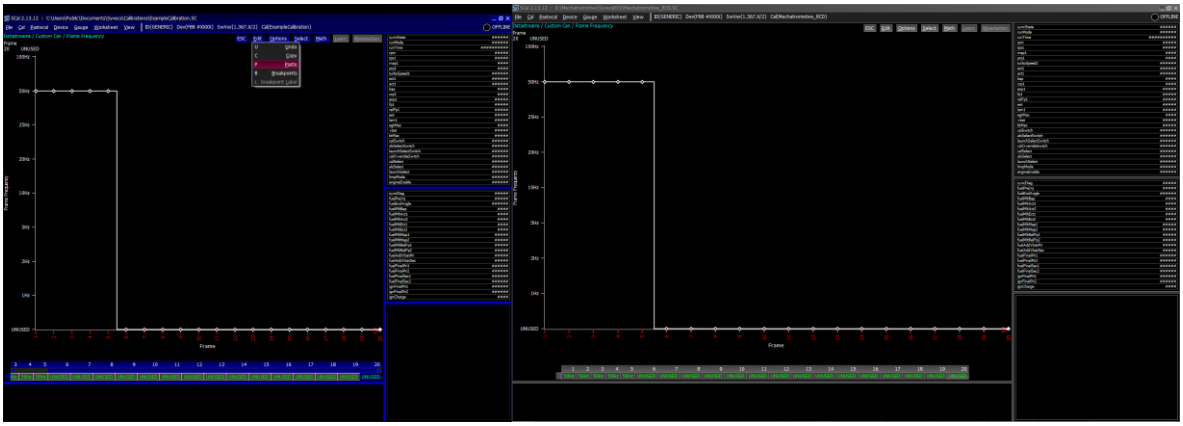
50. Figure - Scal PrintScreen_19

Now go to your current *.sc file. Click on **Select →All.**



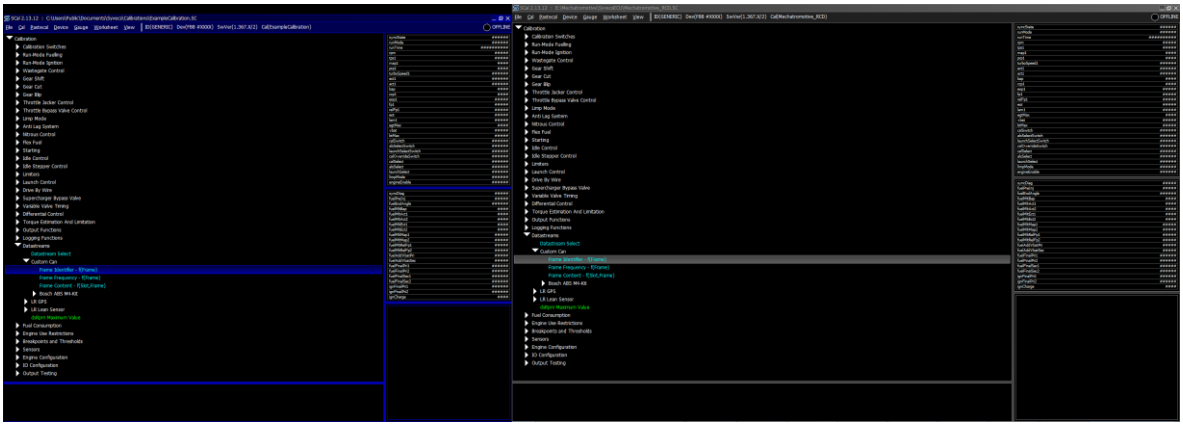
51. Figure - Scal PrintScreen_20

Click on **Edit → Paste,** still in your current *.sc file's window.



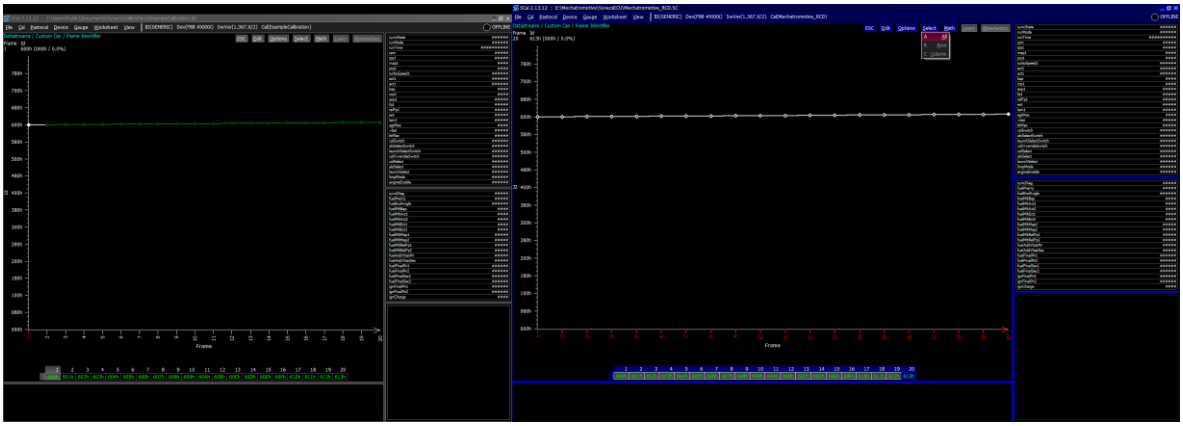
52. Figure - Scal PrintScreen_21

Select **Calibration → Datastreams → Custom CAN → Frame Identifier f(Frame).**



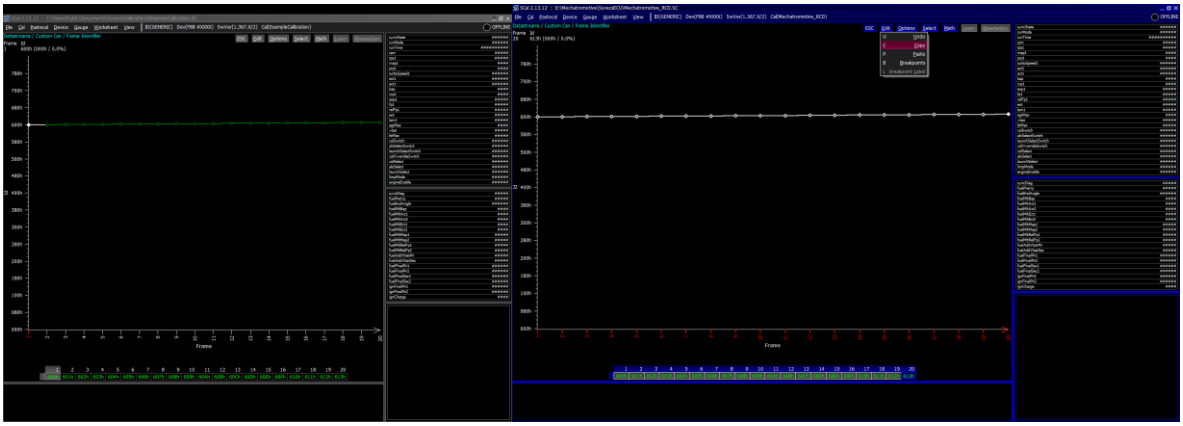
53. Figure - Scal PrintScreen_22

Now in the Mechatromotive_RCD.sc window click on **Select → All.**



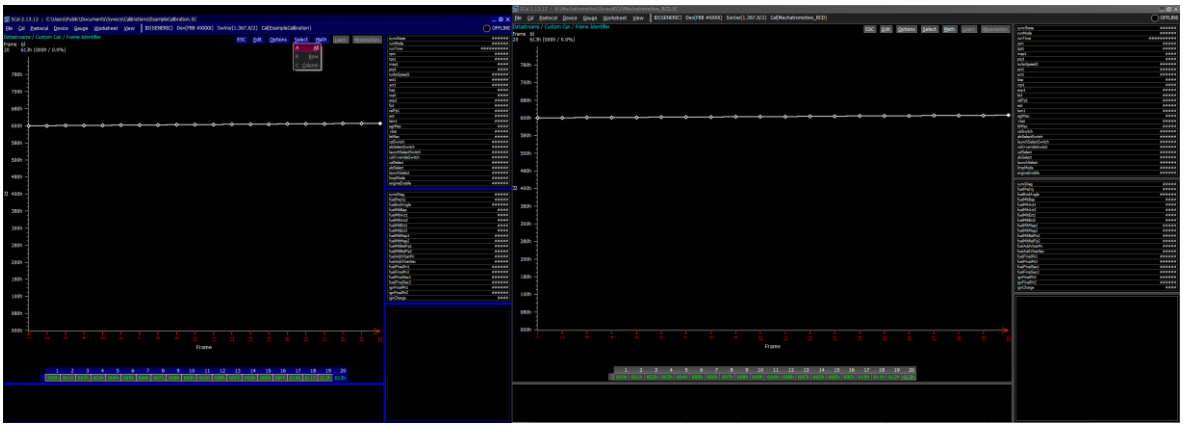
54. Figure - Scal PrintScreen_23

Now select **Edit → Copy,** still in the the Mechatromotive_RCD.sc window.



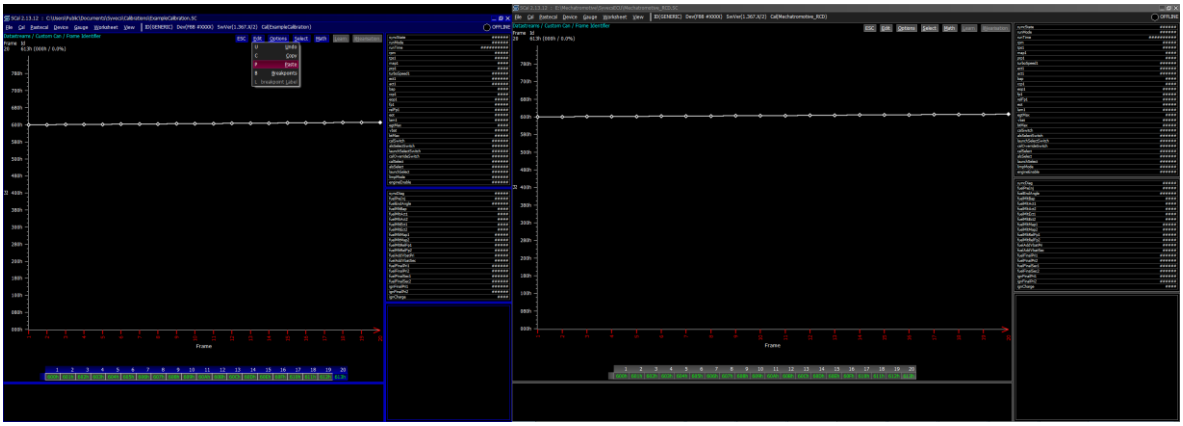
55. Figure - Scal PrintScreen_24

Now go to your current *.sc file. Click on **Select →All.**



56. Figure - Scal PrintScreen_25

Click on **Edit → Paste,** still in your current *.sc file's window.



57. Figure - Scal PrintScreen_26

Now you can close the Mechatromotive_RCD.sc, and save your current *.sc file.

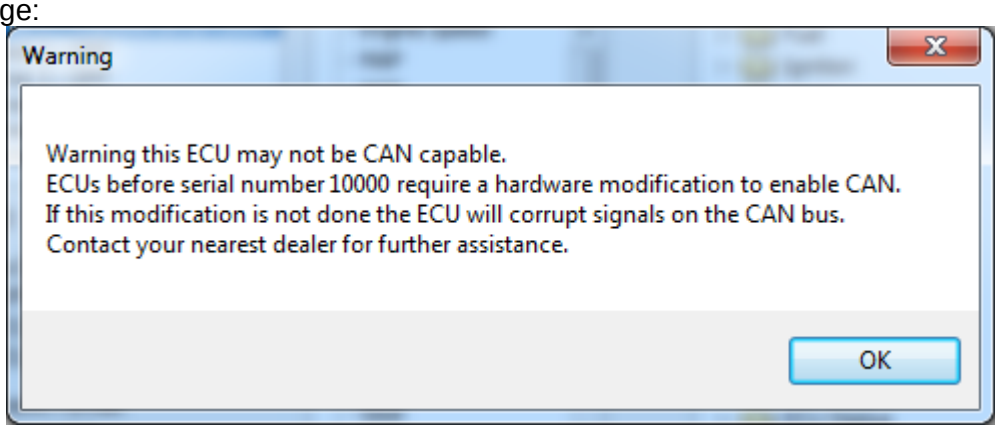
Parameter	Description	Unit	Range
Engine Speed	Motor rpm	RPM	0 - 10000 RPM
TPS1	Throttle Position 1	%	0-100%
VBAT	Battery Voltage	V	5 - 15 V
MAP1	Manifold Absolute Pressure 1	kPa	0 -300 kPa
ECT1	Engine Coolant Temp 1	°C	-25 - 125 °C
AIT1	Air Intake Temperature 1	°C	-25 - 100 °C
EGT1	Exhaust Gas Temperature 1	°C	0 - 1250 °C
EGT2	Exhaust Gas Temperature 2	°C	0 - 1250 °C
LAM1	Lambda Sensor 1	La	0,5 - 1,5 La
LAM2	Lambda Sensor 2	La	0,5 - 1,5 La
FP1	Fuel Pressure 1	kPa	0 - 1000 kPa
FT1	Fuel Temperature 1	°C	-25- 125 °C
EOP1	Engine Oil Pressure 1	kPa	0 - 1000 kPa
EOT	Engine Oil Temperature	°C	-25 - 150 °C
Gear	Gear Position	-	0 - 10
fuelDutyPri1	Injection Duty Cycle	%	0-100 %
fuelComp	Fuel Comp	%	0-100 %
Driven wheel speed	Driven wheel speed	kph	0 - 300 kph
Vehicle speed	Vehicle speed	kph	0 - 300 kph
CCP1	Crank Case Pressure 1	kPa	0 - 110 kPa
ACT1	Air Charge Temperature 1	°C	-25 - 100 °C
BaP	Barometric Pressure	kPa	70 - 110 kPa
IgnFinalPri1	Final Ignition Timing after corrections	deg	-10 - 50 deg
wheelSpin	Ammount of Wheelspin detected by Traction control	%	0 - 100%

10. Table - Protocol Description

5.5. Vi-PEC

5.5.1. VTS

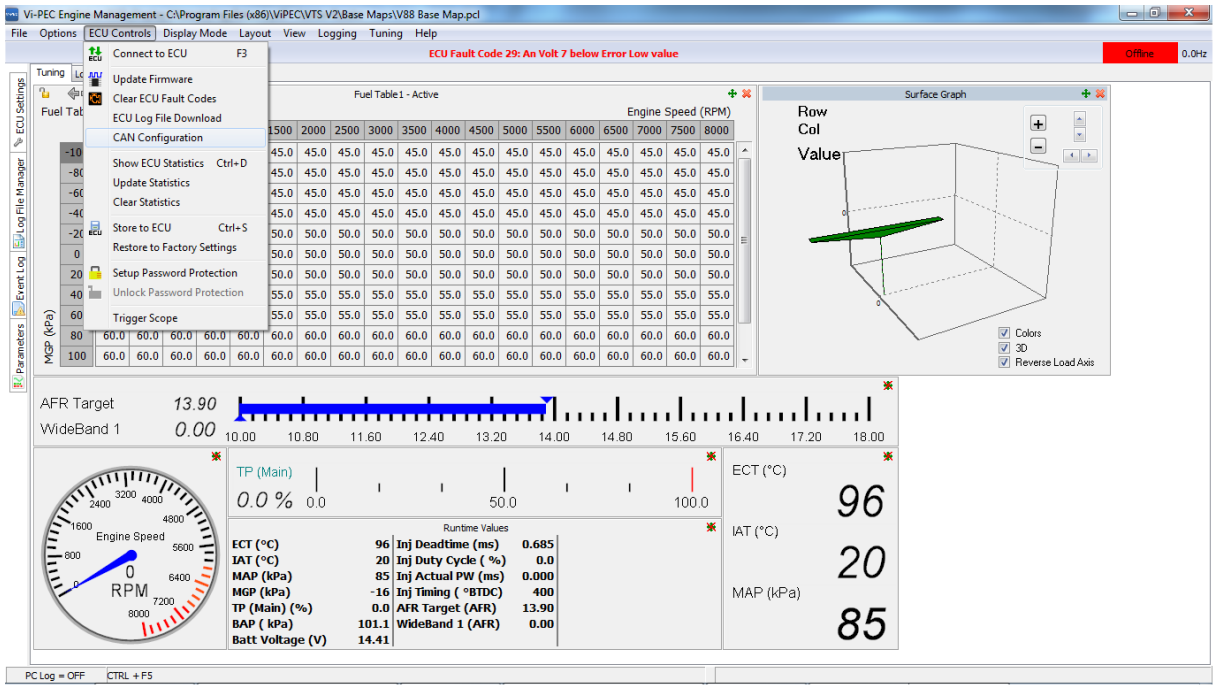
Please note: only available for version 10000 or later! Else you'll get the following warning message:



58. Figure – ViPEC VTS serial warning

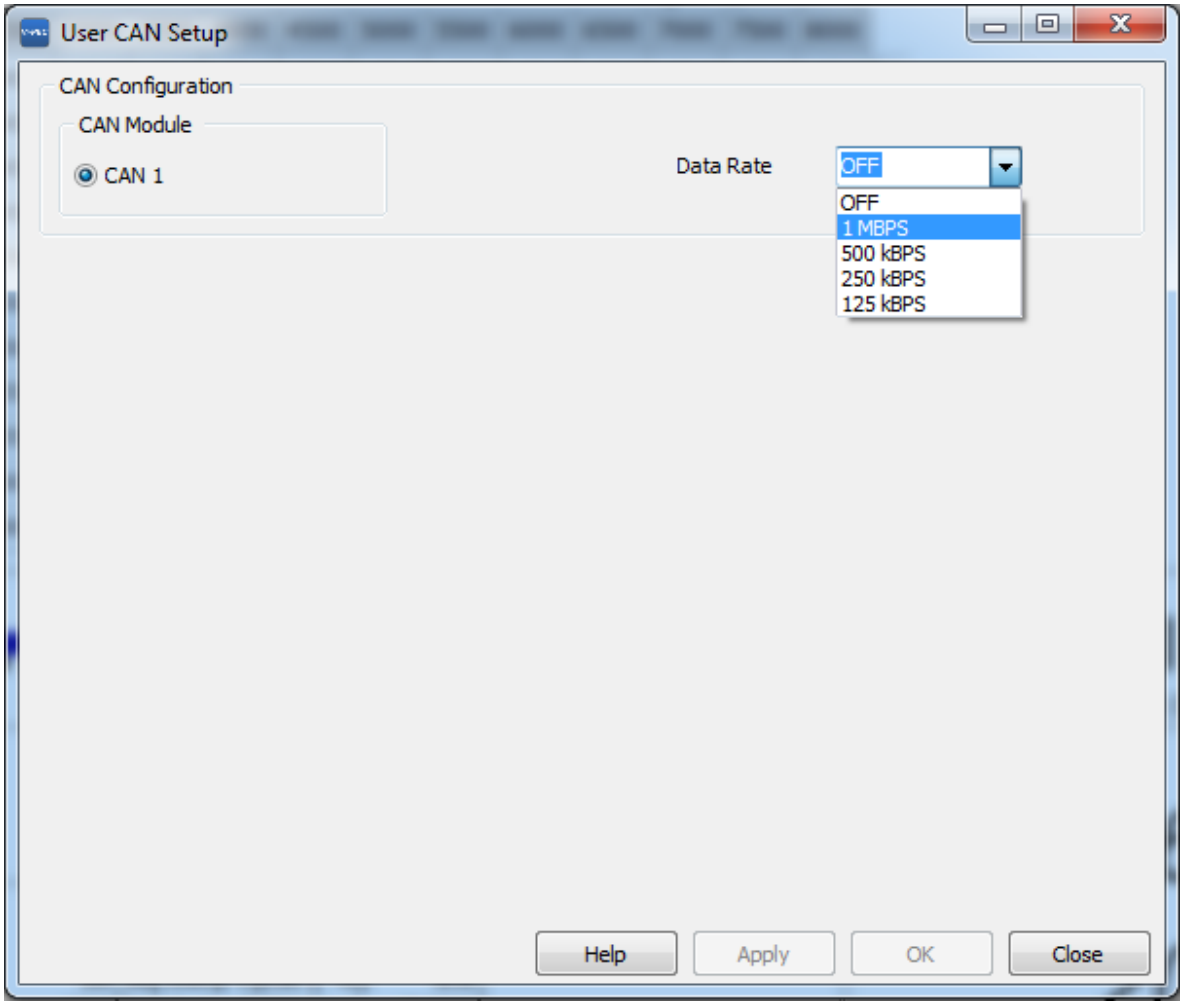
In order to operate your motor controller properly with the RDC display, you have to make the following settings in the Vi-PEC Engine Management software.

Open **ECU Controls menu → CAN Configuration**.

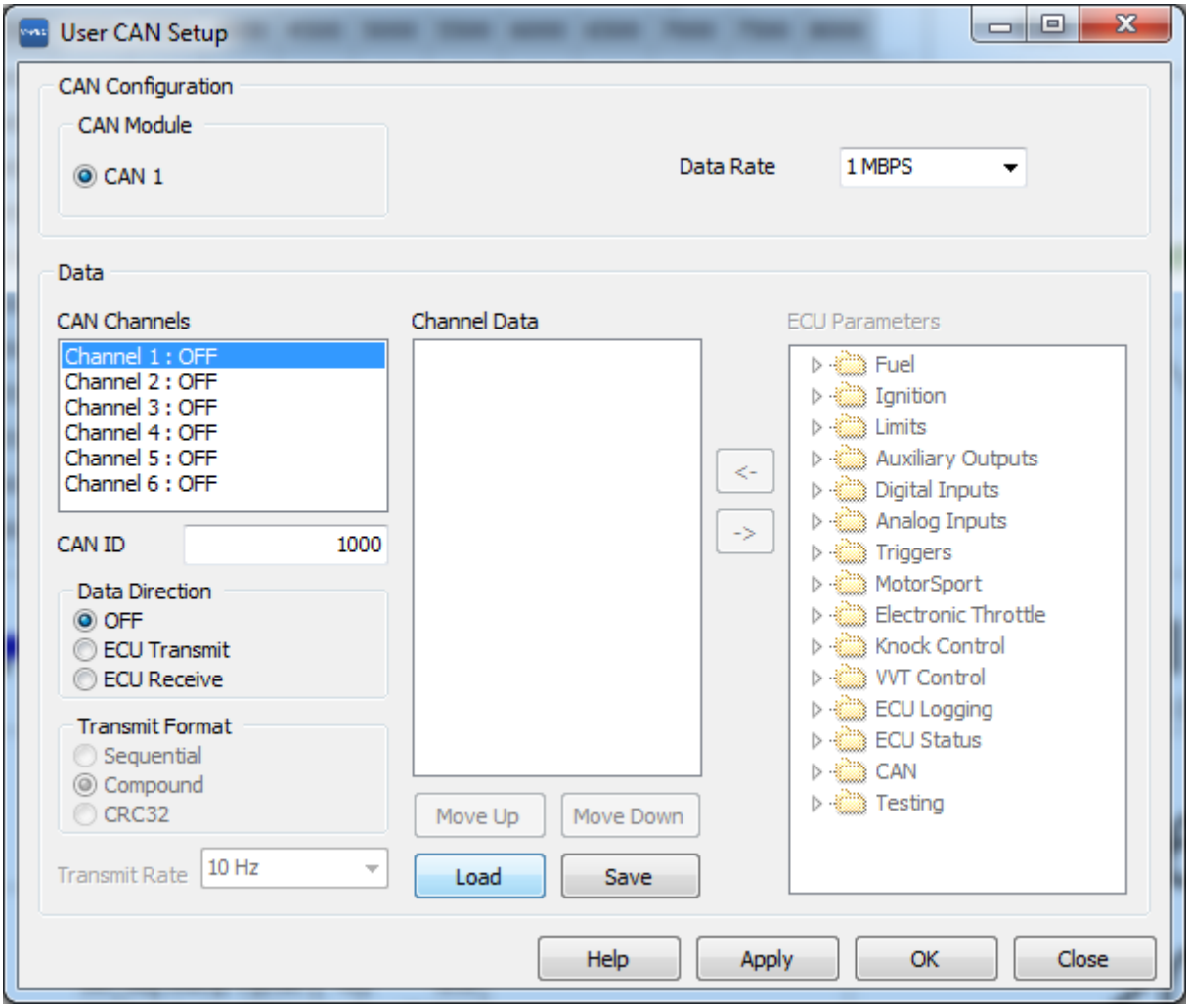


59. Figure – Vi-PEC VTS PrintScreen_1

For Dara Rate, select **1 MBPS.**

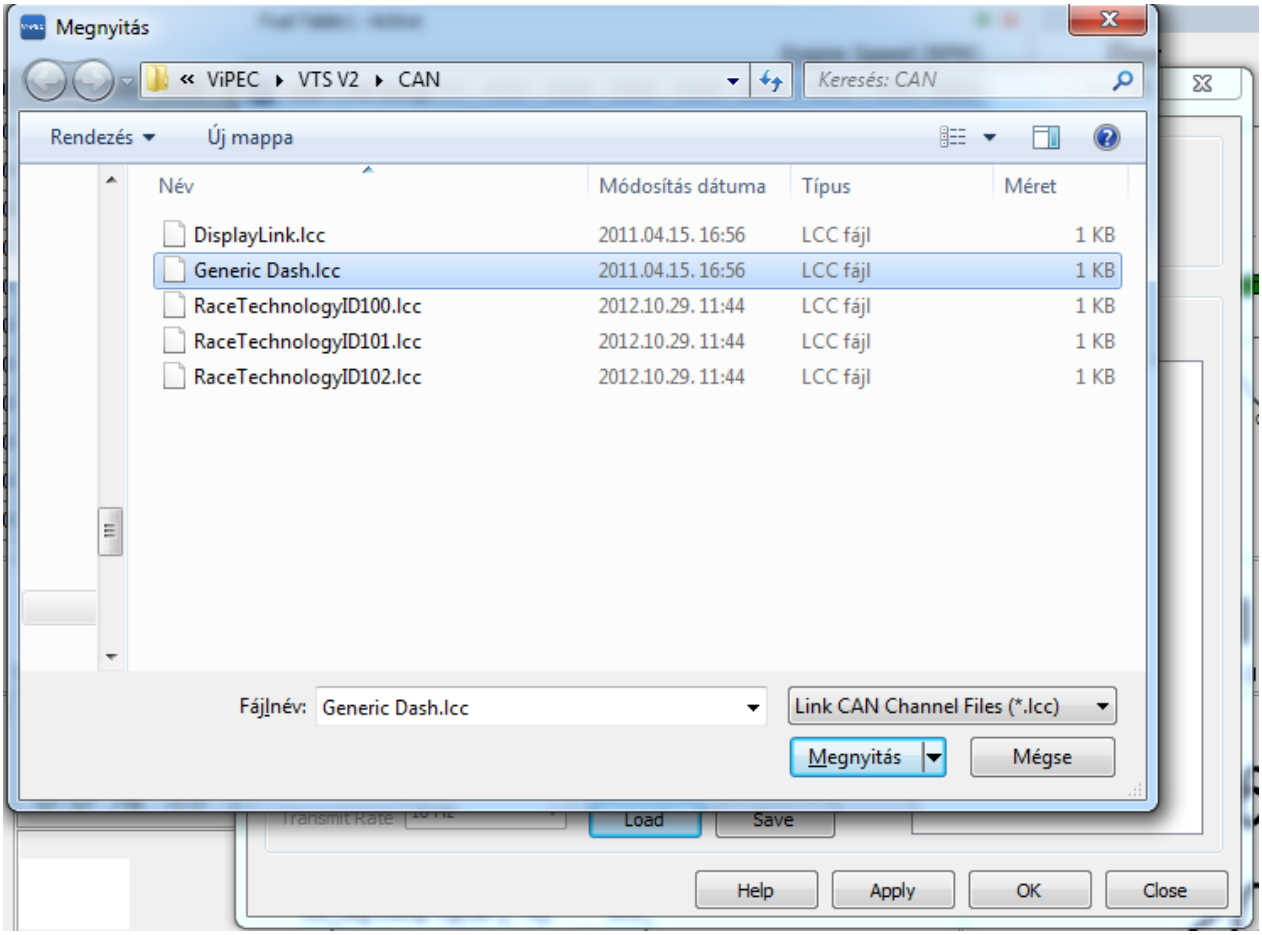


60. Figure - Vi-PEC VTS PrintScreen_2



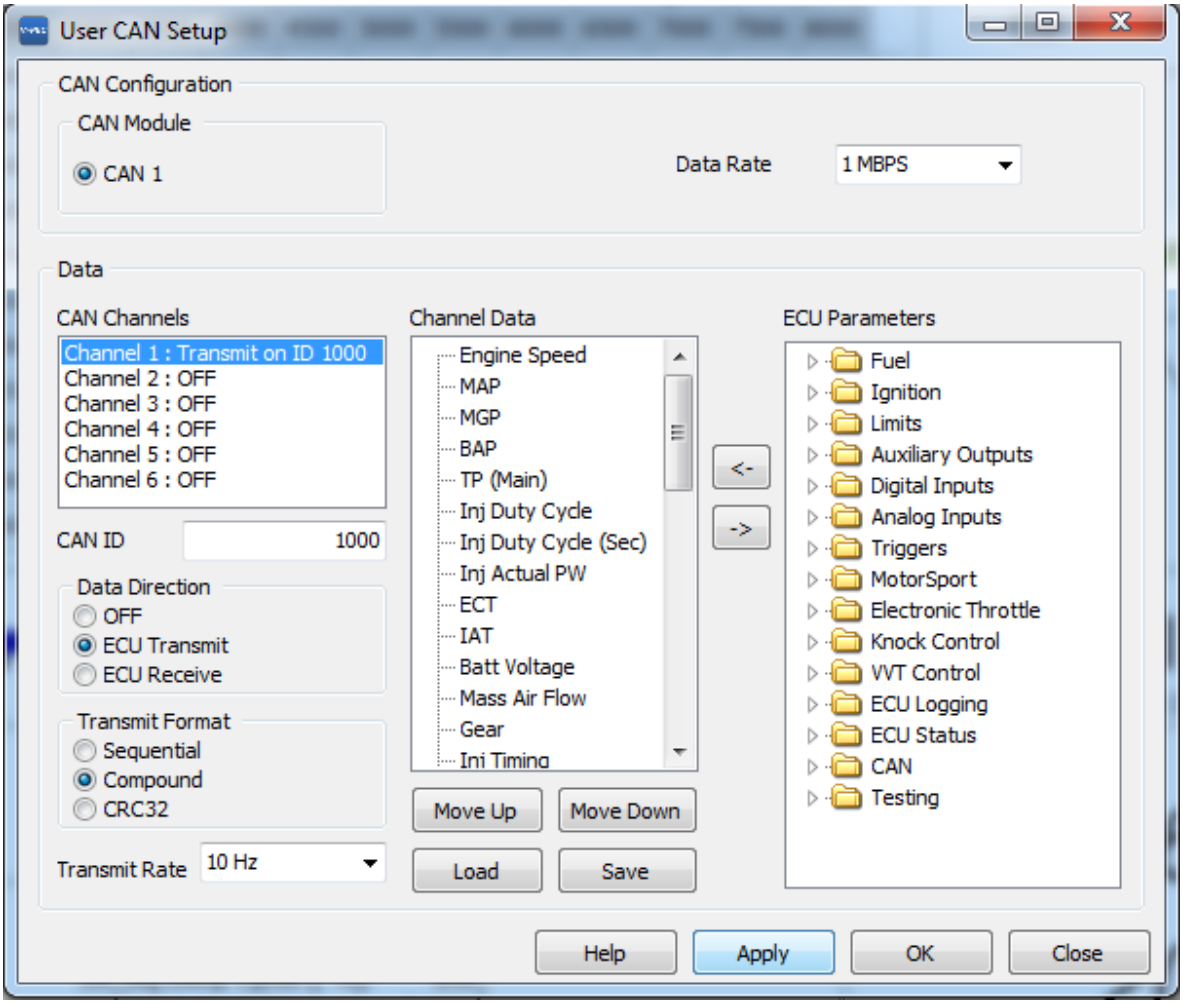
61. Figure - Vi-PEC VTS PrintScreen_3

Click on **Load** button. The following screen will come up:



62. Figure - Vi-PEC VTS PrintScreen_4

Choose in your ViPEC / VTS V2 library: **Generic Dash.lcc** and click **Open**.



63. Figure - Vi-PEC VTS PrintScreen_5

Here you should set/check the CAN ID, Data Direction, Transmit Format and Transmit Rate.
Recommended settings:
CAN ID: 1000
Data Direction: ECU Transmit
Transmit Format: Compound
Transmit Rate: 10Hz.
Click **OK**.

Data from Vi-PEC VTS Engine Management System:

Parameter	Description	Unit	Range
Engine Speed	Motor rpm	RPM	0 - 15000 RPM
MAP	Manifold Absolute Pressure	kPa	0 - 650 kPa
MGP	Manifold Gauge Pressure	kPa	-100 - 550 kPa
BAP	Barometric Pressure	kPa	0 - 200 kPa

TP (Main)	Throttle Position	%	0-100%
Inj Duty Cycle	Injection Duty Cycle	%	0-100 %
Inj Duty Cycle (Sec)	Injection Duty Cycle	%	0 - 100%
Inj Actual PW	Injector Pulse Width	ms	0 - 65 ms
ECT	Engine Temp Correction	°C	-50 - 205 °C
IAT	Intake Air Temperature	°C	-20 - 205 °C
Batt Voltage	ECU Volts	V	0 - 65 V
Mass Air Flow	Mass Air Flow	L/Hr x 10	0 - 6500 g/s
Gear	Gear Position	-	0 - 6
Inj Timing	Injector Timing	deg	0 - 719 deg
Ign Angle	Ignition Timing	deg	-100 - 100 deg
Inlet / LH Posn	Cam Inlet Position L	deg	0 - 60 deg
Inlet RH Posn	Cam Inlet Position R	deg	0 - 60 deg
Exh RH Posn	Cam Exhaust Position R	deg	-60 - 0 deg
WideBand 1	Lambda Sensor	AFR	0 - 65 AFR
WideBand 2	Lambda Sensor	AFR	0 - 65 AFR
Trig 1 Err Counter	Trig 1 Error Counter	-	0 - 255
Fault Codes	Fault Codes	-	0 - 255
Fuel Pressure	Fuel Pressure	kPa	0 - 6550 kPa
Oil Temp	Oil Temperature	°C	-50 - 205 °C
Oil Pressure	Oil Pressure	kPa	0 - 6550 kPa
Speed (DI #1)	Speed 1	kph	0 - 1000 kph
Speed (DI #2)	Speed 2	kph	0 - 1000 kph
Speed (DI #3)	Speed 3	kph	0 - 1000 kph
Speed (DI #4)	Speed 4	kph	0 - 1000 kph
Knk Level Cyl 1	Knock Sensor 1	units	0 - 1000 units
Knk Level Cyl 2	Knock Sensor 2	units	0 - 1000 units
Knk Level Cyl 3	Knock Sensor 3	units	0 - 1000 units
Knk Level Cyl 4	Knock Sensor 4	units	0 - 1000 units
Knk Level Cyl 5	Knock Sensor 5	units	0 - 1000 units
Knk Level Cyl 6	Knock Sensor 6	units	0 - 1000 units
Knk Level Cyl 7	Knock Sensor 7	units	0 - 1000 units
Knk Level Cyl 8	Knock Sensor 8	units	0 - 1000 units
Limits Flags Words	Limits Flags Words*	-	0 - 65536

*See 10. Table

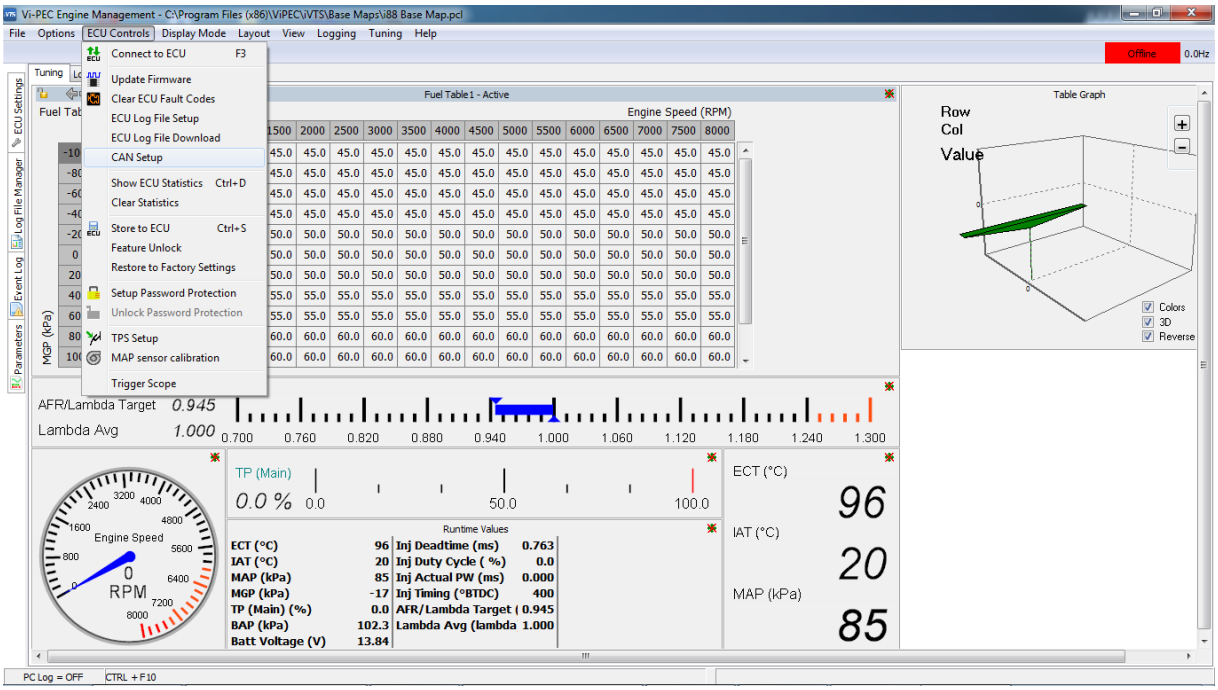
11. Table – Protocol description

Bit	Description
0	RPM Limit
1	MAP Limit
2	Speed Limit
3	Maximum Ignition Flag
4	Anti-lag Ignition Cut
5	High Supply Voltage Limit
6	Overrun Flag
7	Traction Limit
8	Low Supply Voltage Flag
9	Launch RPM Limit
10	Wakeup Flag
11	GP RPM Limit 1
12	CL Stepper Limit
13	GP RPM Limit 2
14	EThrottle Limit
15	Cyclic Idle Active

12. Table- Limits Flag Definition

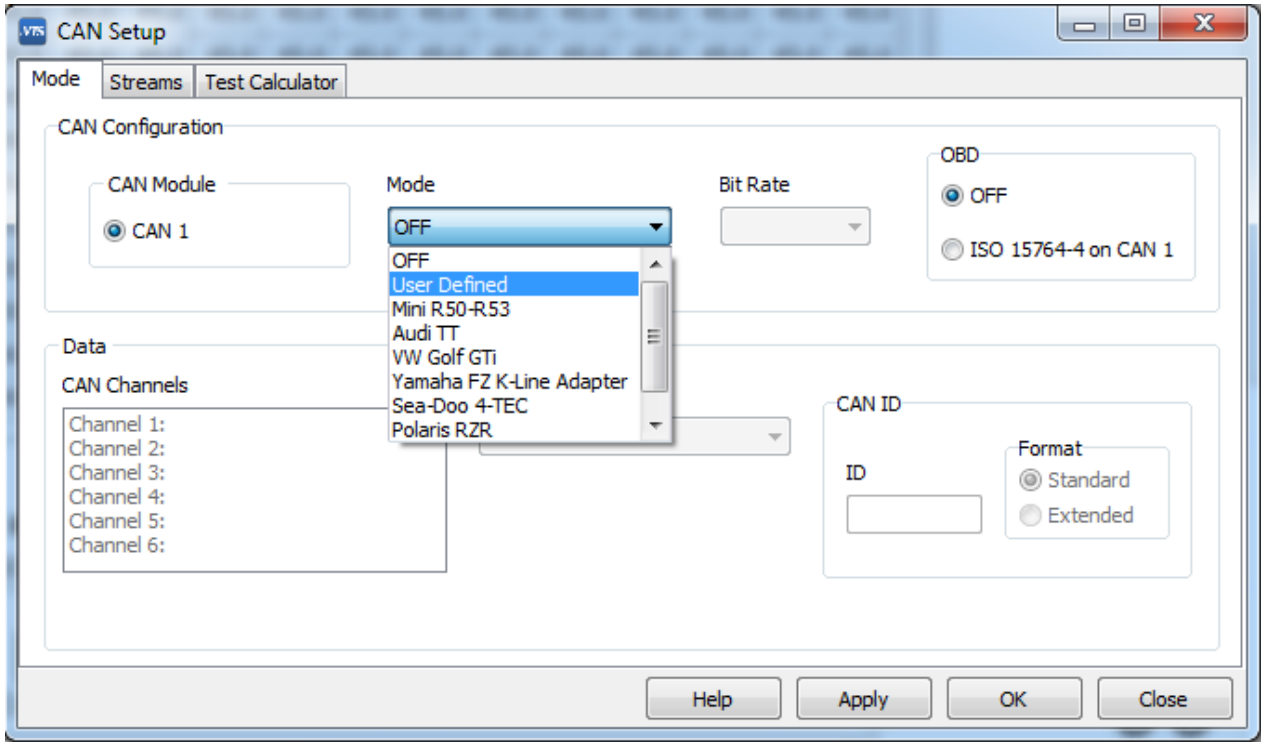
5.5.2. iVTS

In order to operate your motor controller properly with the RDC display, you have to make the following settings in the Vi-PEC Engine Management System software.



64. Figure – Vi-PEC iVTS PrintScreen_1

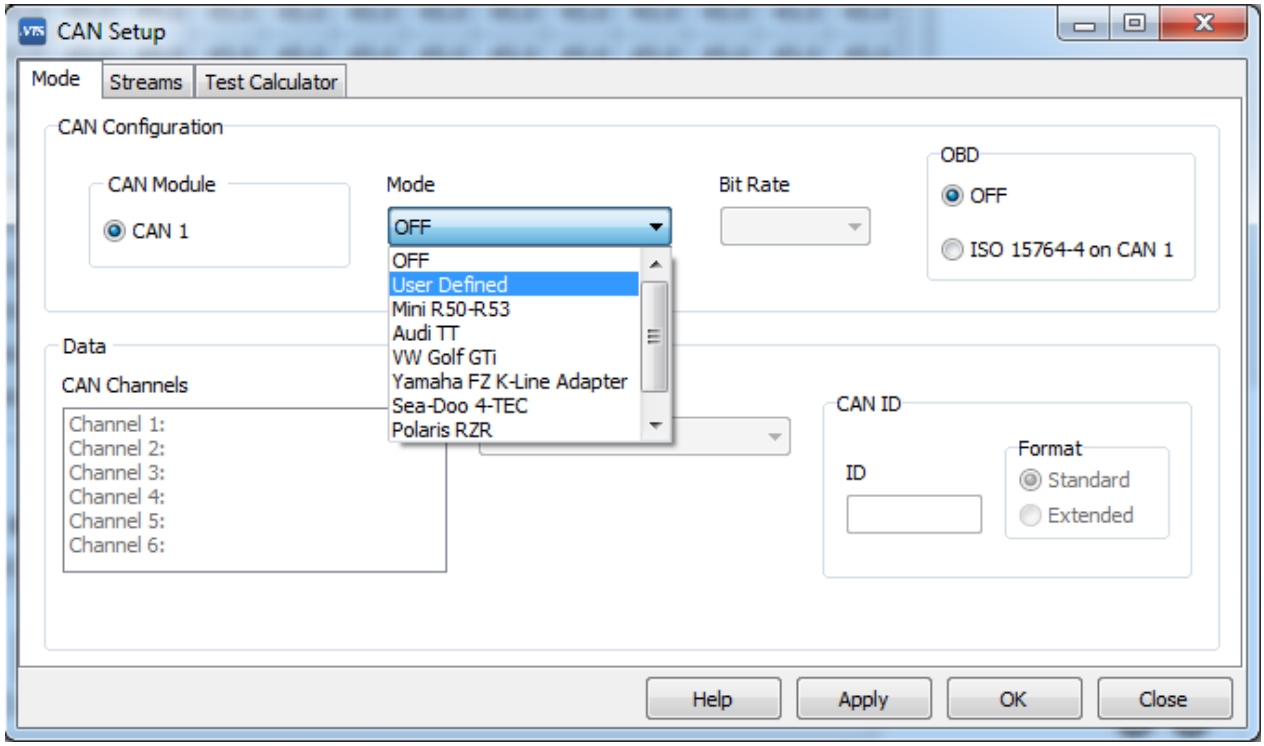
Open **ECU Controls menu → CAN Setup**. You will see the following screen:



65. Figure - Vi-PEC iVTS PrintScreen_2

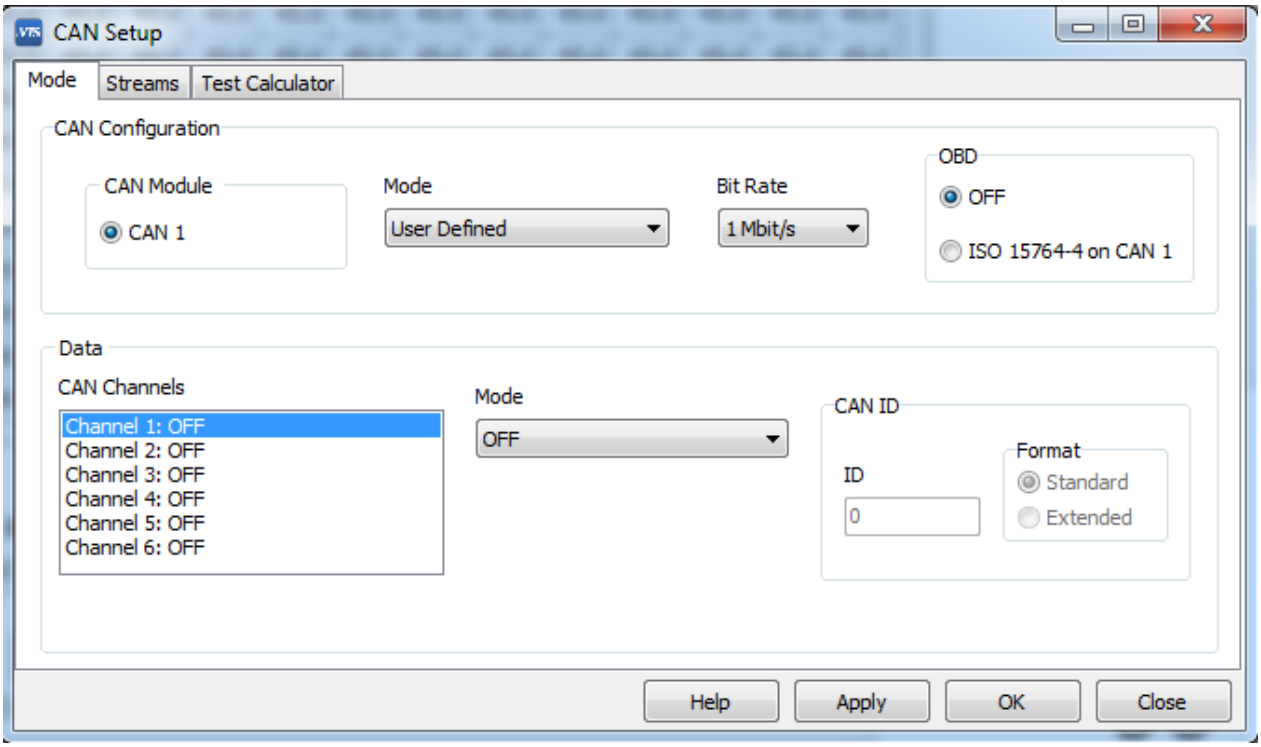
In the Mode menu, select **User Defined.**

Now click on **Channel 1.**



66. Figure - Vi-PEC iVTS PrintScreen_3

In the Mode menu, select **Transmit Generic Dash.**



67. Figure - Vi-PEC iVTS PrintScreen_4

Data from Link Engine Management System:

Parameter	Description	Unit	Range
Engine Speed	Motor rpm	RPM	0 - 15000 RPM
MAP	Manifold Absolute Pressure	kPa	0 - 650 kPa
MGP	Manifold Gauge Pressure	kPa	-100 - 550 kPa
BAP	Barometric Pressure	kPa	0 - 200 kPa
TP (Main)	Throttle Position	%	0-100%
Inj Duty Cycle	Injection Duty Cycle	%	0-100 %
Inj Duty Cycle (Sec)	Injection Duty Cycle	%	0 - 100%
Inj Actual PW	Injector Pulse Width	ms	0 - 65 ms
ECT	Engine Temp Correction	°C	-50 - 205 °C
IAT	Intake Air Temperature	°C	-20 - 205 °C
Batt Voltage	ECU Volts	V	0 - 65 V
Mass Air Flow	Mass Air Flow	L/Hr x 10	0 - 6500 g/s
Gear	Gear Position	-	0 - 6

Inj Timing	Injector Timing	deg	0 - 719 deg
Ign Angle	Ignition Timing	deg	-100 - 100 deg
Inlet / LH Posn	Cam Inlet Position L	deg	0 - 60 deg
Inlet RH Posn	Cam Inlet Position R	deg	0 - 60 deg
Exh RH Posn	Cam Exhaust Position R	deg	-60 - 0 deg
WideBand 1	Lambda Sensor	AFR	0 - 65 AFR
WideBand 2	Lambda Sensor	AFR	0 - 65 AFR
Trig 1 Err Counter	Trig 1 Error Counter	-	0 - 255
Fault Codes	Fault Codes	-	0 - 255
Fuel Pressure	Fuel Pressure	kPa	0 - 6550 kPa
Oil Temp	Oil Temperature	°C	-50 - 205 °C
Oil Pressure	Oil Pressure	kPa	0 - 6550 kPa
Speed (DI #1)	Speed 1	kph	0 - 1000 kph
Speed (DI #2)	Speed 2	kph	0 - 1000 kph
Speed (DI #3)	Speed 3	kph	0 - 1000 kph
Speed (DI #4)	Speed 4	kph	0 - 1000 kph
Knk Level Cyl 1	Knock Sensor 1	units	0 - 1000 units
Knk Level Cyl 2	Knock Sensor 2	units	0 - 1000 units
Knk Level Cyl 3	Knock Sensor 3	units	0 - 1000 units
Knk Level Cyl 4	Knock Sensor 4	units	0 - 1000 units
Knk Level Cyl 5	Knock Sensor 5	units	0 - 1000 units
Knk Level Cyl 6	Knock Sensor 6	units	0 - 1000 units
Knk Level Cyl 7	Knock Sensor 7	units	0 - 1000 units
Knk Level Cyl 8	Knock Sensor 8	units	0 - 1000 units
Limits Flags Words	Limits Flags Words*	-	0 - 65536

*See 12. Table

13. Table – Protocol Description

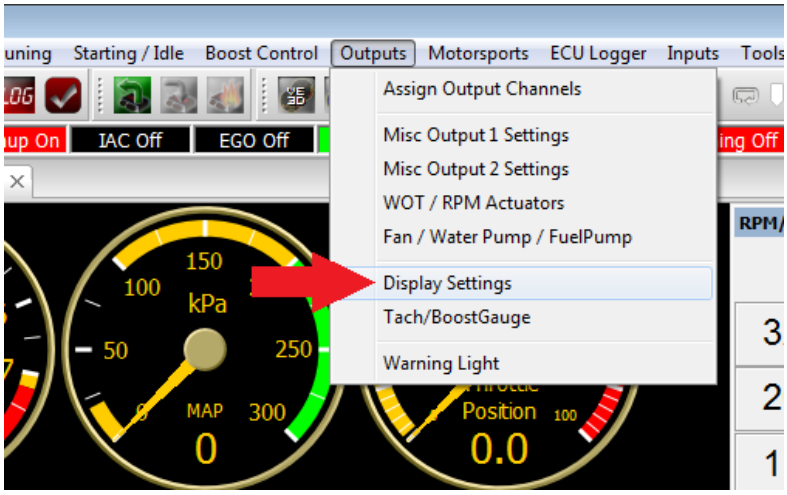
Bit	Description
0	RPM Limit
1	MAP Limit
2	Speed Limit
3	Maximum Ignition Flag
4	Anti-lag Ignition Cut
5	High Supply Voltage Limit
6	Overrun Flag

7	Traction Limit
8	Low Supply Voltage Flag
9	Launch RPM Limit
10	Wakeup Flag
11	GP RPM Limit 1
12	CL Stepper Limit
13	GP RPM Limit 2
14	EThrottle Limit
15	Cyclic Idle Active

14. Table – Limits Flag Definition

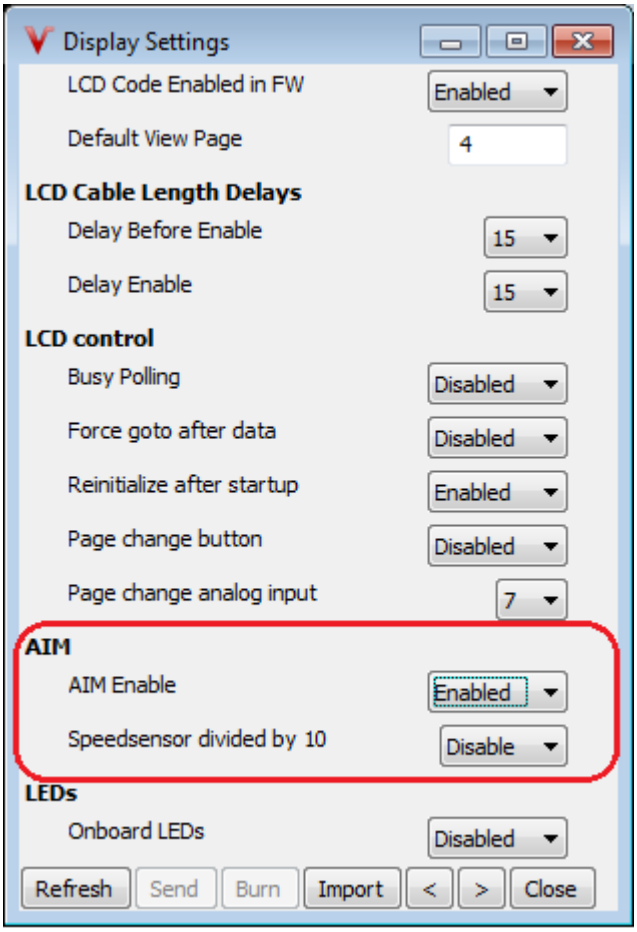
5.6. VEMS

In order to operate your motor controller properly with the RDC display, you have to make the following settings in the VemsTune software:



68. Figure - VEMS PrintScreen_1

Select **Outputs → Display Settings** menu.



69. Figure - VEMS PrintScreen_2

In this menu, set **AIM Enable** to **Enabled.**

Signal	Channel #	Frequency [Hz]	Transform	Units
RPM	1	10	y=x	RPM
Wheel speed	5	10	y=x/10	km/h
Oil pressure	9	5	y=x/1000	bar
Oil temperature	13	2	y=x/10-100	°C
Water temperature	17	2	y=x/10-100	°C
Fuel pressure	21	5	y=x/1000	bar
Battery voltage	33	5	y=x/100	Volts
Throttle angle	45	10	y=x/10	°
Manifold press	69	10	y=x	mbar
Air charge temperature	97	2	y=x/10-100	°C
Exhaust temperature	101	2	y=x/10-100	°C
Lambda sensor	105	10	y=x/1000	Lambda
Fuel temp	109	2	y=x/10-100	°C
Gear	113	5	y=x	0=rev, 1=neutral, 2=first, 3=second, etc.
Errors	125	2	-	ECU-specific error flags

15**. Table -** Protocol Description of VEMS ECU

5.7. None

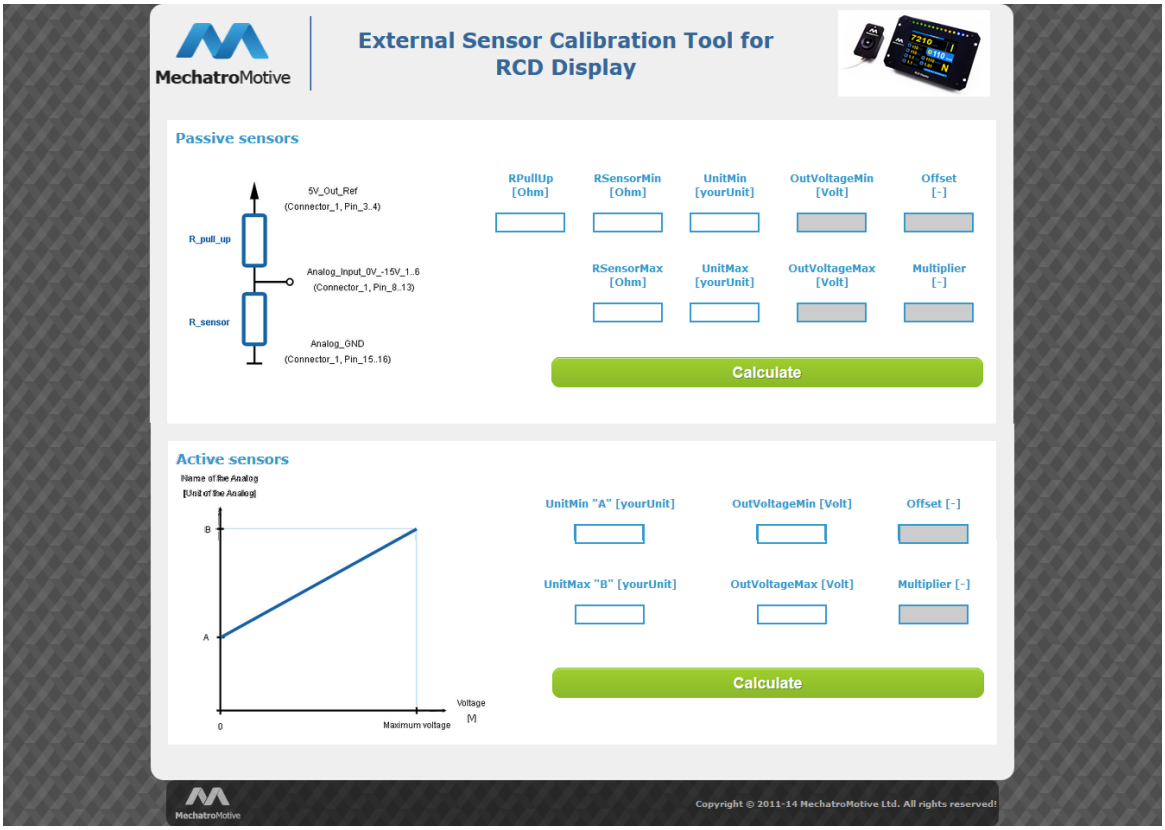
If you choose this option, the RCD Display shows the value of the connected sensors on the screens, and it's not searching for a connected ECU. You can find the connection points in "Function without ECU" column of the tables in the following sections: 4.1.1 Main Connector 1 and 4.1.2 Main Connector 2.

6. Connecting sensors

6.1. Connecting analog sensors

The active sensor's output voltage are proportional to the measured physical parameter, typically 0 – 5 V or 0 - 10 V.

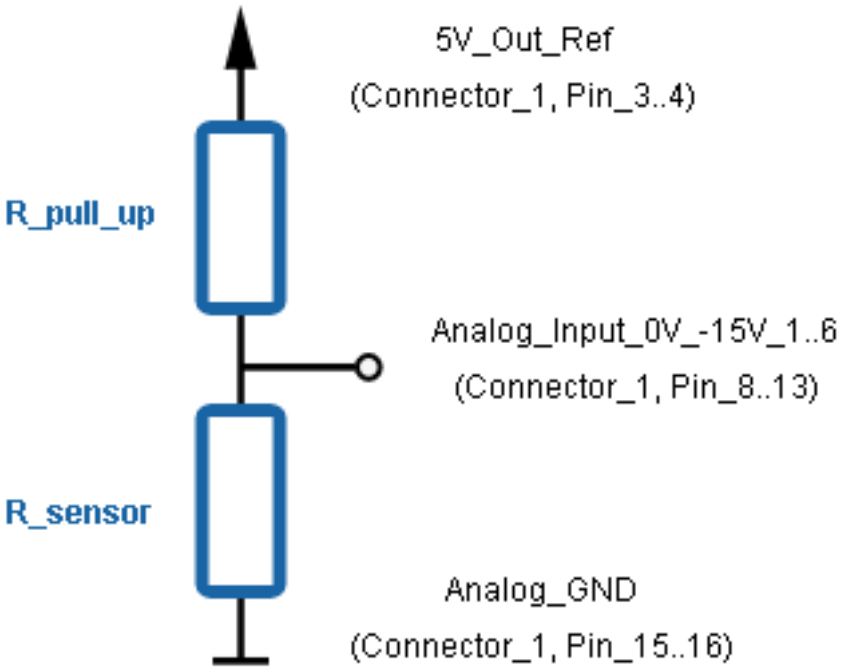
- Connect the GDN pin of the sensor to the „**Analog_GND**“ , named „**Main Connector 1**“ connector.
- Connect the VDD pin of the sensor to the „**5V_Out_Ref**“ or „**12V_In**“ pin of the „**Main Connector 1**“ connector.
- Connect the OUT pin of the sensor to „**Main Connector 1**“ „**Analog_Input_0V-15V_X**“ pin.
- Do the sensor calibration! If you need help, go to the following page: http://www.mechatromotive.com/pullup.php, where you can write your values into the white boxes, and the computer does the calculations. (**50. Figure)**



70. Figure – The online calibration page

6.1.1. Passive sensors

The passive sensors usually modulate their resistance depending on the physical parameter's change. For a such sensor a pull-up resistor need to be placed into the circuit, so the analog input can detect the changes.

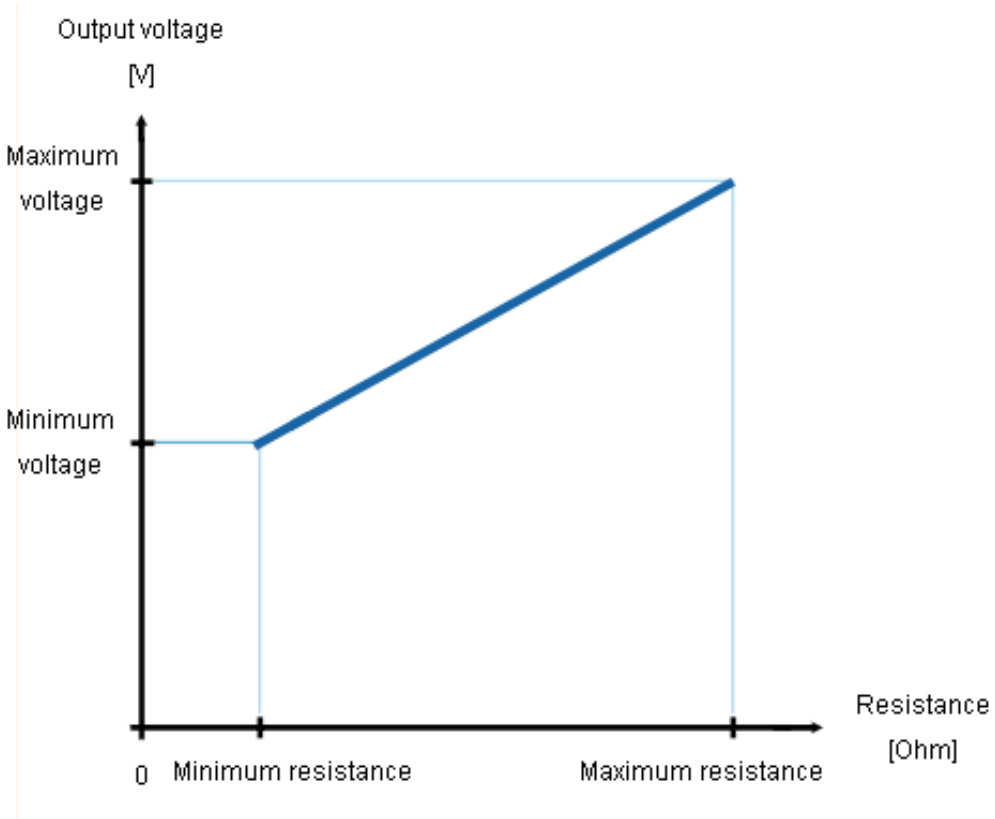


71. Figure – How to connect the pullup resistor

The sensor's output voltage depends on the value of the connected pull-up resistor. To complete the calibration the sensor's output voltage must be determined at two points. If possible, measure the voltages. If not, perform the following calculation with two known resistance values.

$$Output_voltage_{MIN} = 5\frac{R_{SENSOR_MIN}}{R_{SENSOR_MIN} + R_{PULLUP}}$$

$$Output_voltage_{MAX} = 5\frac{R_{SENSOR_MAX}}{R_{SENSOR_MAX} + R_{PULLUP}}$$



72. Figure – Resitor based sensor output with pullup

After connecting the sensor perform the sensor calibration!

6.1.2. NTC

If you connect NTC temperature sensor, the following relation may work best:

$$R_{PULLUP} = \frac{1}{4}R_{SENSOR}$$

6.1.3. PT100-PT1000

If you connect PT100 or PT1000 temperature sensor, the following relation may work best:

$$R_{PULLUP} = R_{SENSOR}$$

6.2. Connecting switch sensors

- Connect one of the switch sensor's pins to the **„Digital_Input_x"** named pin of the **„Main Connector 2"** connector.
- Connect the sensor's other pin to a positive supply voltage, for example to the **„12V_In"** pin of the **„Main Connector 1"** connector.
- If the recieved voltage lies between (5V-18V), the inputs show binary value 1.

6.3. Connecting impulse type sensors

- Connect the sensor's impulse output to the **„Impulse_x"** named pin of the **„Main Connector 2"** connector.
- At the input 5V-18V level square wave signal can be detected by the device.
- The input signal is between 1,5 Hz – 10.916 Hz, so it can be measured between 90 rpm – 655.000 rpm.
- Many sensors give more impulse during one rev. In this case there is a possibility to set a multipliar value, with which the device can show a real rpm. You can find this value in the **OTHERS** window of the **SETUP** menu, reaching from the main menu.

Example

If the sensor gives 10 impulse per 1 rev, set the value of the **Imp_x_multiplier** to 1/(impulse numbers per rev), thus 0,1.

6.4. Connecting the thermocouples

- The RCD can handle 2 „K" type thermocouple. Connect the thermocouple's positive terminal (usually green) to the **„Temperature_K_x (Pozitive)"** in **„Main Connector 1".**

  Connect the thermocouple's negative terminal (usually white) to the **„Analog_GND"** in **„Main Connector 1".**

- If you connected the terminals the wrong way, the system will not suffer any damage. In that case, if the temperature increases, the displayed value will decrease.

7. Configuration Options

- At first enter to the main menu for settings.
- In the basic screen push the „**OK**" button and choose the **SETUP** menu from the possible menu points.
- Now you can scroll with the right „►" and left „◄" arrows to choose the required setting.

The data is saved in non-forgettable memory, therefore do not need to be redefined when you restart the display.

7.1. Entering data

In the cases you need to type in numbers or text to perform a setting, there is a keyboard screen available. If you should type numbers, there are only numbers on the keyboard, otherwise there are other characters, as well.

The type window appears when you move the cursor to that parameter you want to modify, and push the „**OK**" button on the control panel.

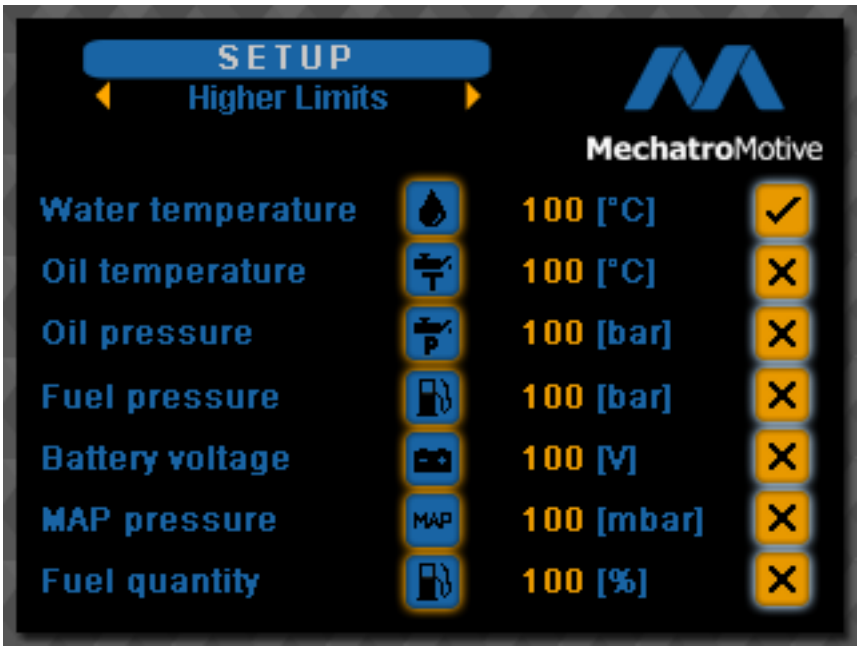
73. Figure – Type window

If necessary you can use the modifier keys (SHIFT, CAPSLOCK, SPACE, BACKSPACE) for typing in the new data. If you have successfully completed the data entry, navigate to the „**OK**" button on the keyboard, then push the „**OK**" button of the navigator. Then you can see the entered number as the alerting threshold limit of the selected parameter.

If you would like to keep the original data, navigate to the „**esc**" button on the keyboard screen then push „**OK**" button on the navigation panel.
After that, you can change other parameters as well. The changes will be activated immediately, but will only be saved if you switch screen. You can switch the screen if you overstep the first or the last parameter using the up „▲" or the down „▼" arrows. At this time the cursor jumps to the name of the screen and you can choose from other screens using the right „►" or left „◄" arrows.

7.2. Setting the alerts

Starting from the basic screen enter to the **ALARM SETUP** screen as it is written at 6. point. There are two **ALARM SETUP** screens, where you can change the lower (**Lower Limits**) and the upper (**Higher Limits**) alerting limits. It is not necessary to choose an alert limit for every parameter. You can activate the parameter if you choose the „√" sign, next to the parameter. You can deactivate the parameter if you choose the „--" sign.



74. Figure – Set alarm

Definable alarm limits for the parameters:

Parameter	Description
Water temperature	Water temperature (DTA)
Oil temperature	Oil temperature (DTA)
Oil pressure	Oil pressure (DTA)
Fuel pressure	Fuel pressure (DTA)
Battery voltage	Battery voltage (DTA)
MAP pressure	MAP pressure (DTA)
Fuel level	Fuel level (RCD)

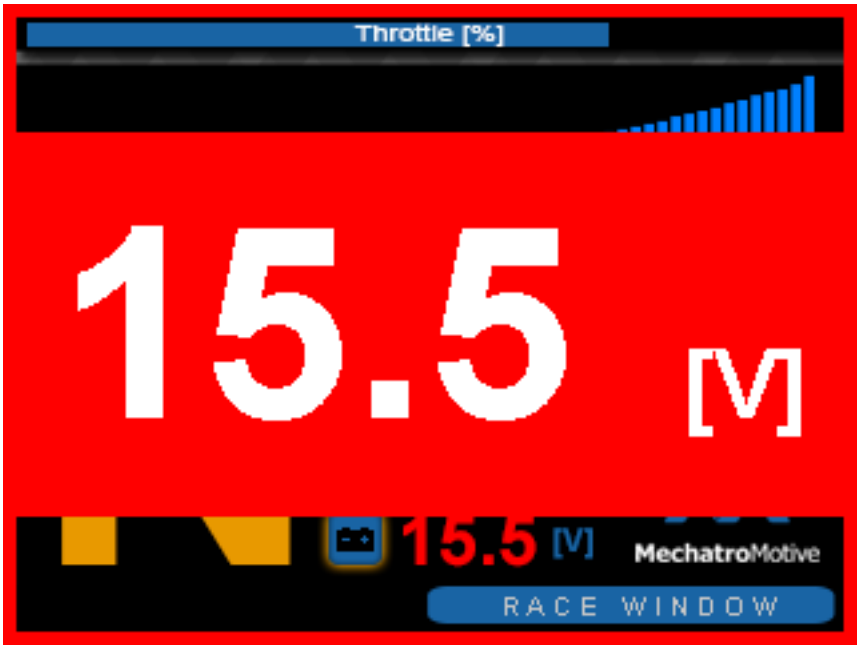
16. Table - Definable alarm limits for the parameters

If you navigate the cursor to the numerical value and push „**OK**" on the navigation panel, the keyboard screen appears. Now you can type in a new value, as it is written in the 6.1. point.

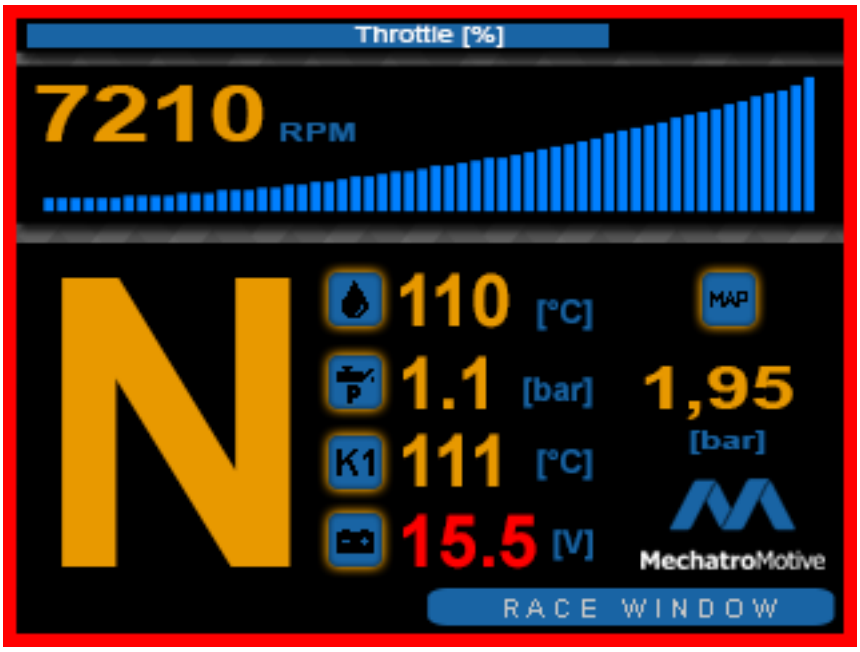
Working

The defined alerts start to work immediately after setting. If any measured alerting parameters are out of the defined range, a full-screen alert box appears, showing the name and value of the critical parameter. If you would like to return to the other parameters and screens, push the „**OK**" button. The side of the screen remains red until the alarm is active.

If the engine speed is below 600 rpm, the oil pressure and fuel pressure alarming parameters are not active.



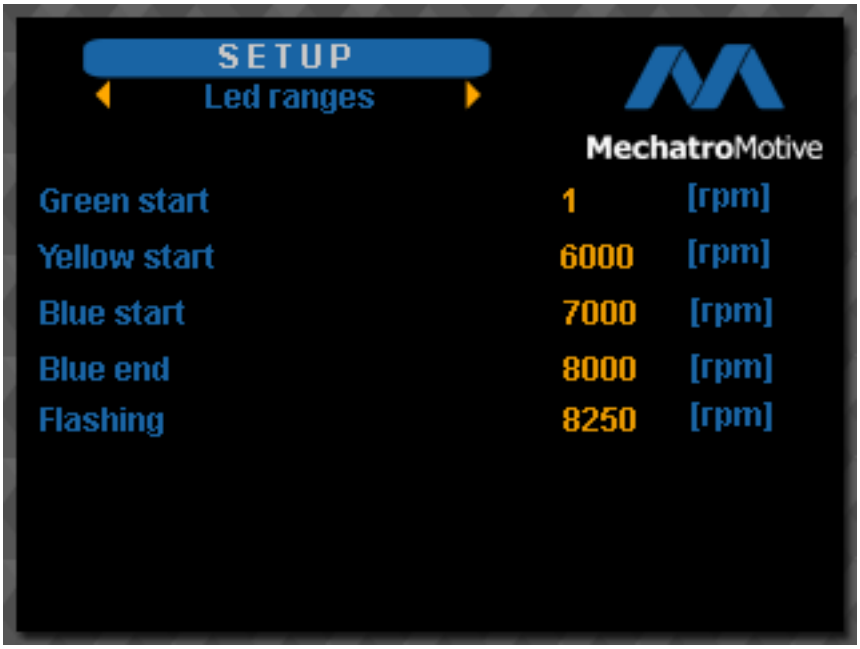
75. Figure – Alarm_1



76. Figure – Alarm_2

7.3. RPM LED bar setting

At the top of the display you can see a LED line, for which segments you can define the RPM, when they flash. You can define starter and final RPM for every color (8 green leds, 3 yellow leds, 3 blue leds). The machine automatically calculates when it is necessary to light up the middle LEDs. If you setup the "**Flashing**" mode, the hole LED bar starts flashing when the rpm reaches the value.



77. Figure – LED ranges

Parameters, that can be ordered to the LED bar:

Parameter	Description
Green start	The RPM at which the first green LED lights up
Yellow start	The RPM at which the first yellow LED lights up
Blue start	The RPM at which the first blue LED lights up
Blue end	The RPM at which the last blue LED lights up
Flashing	The engine speed at which the LED bar start flashing.

17. Table - LED bar parameters

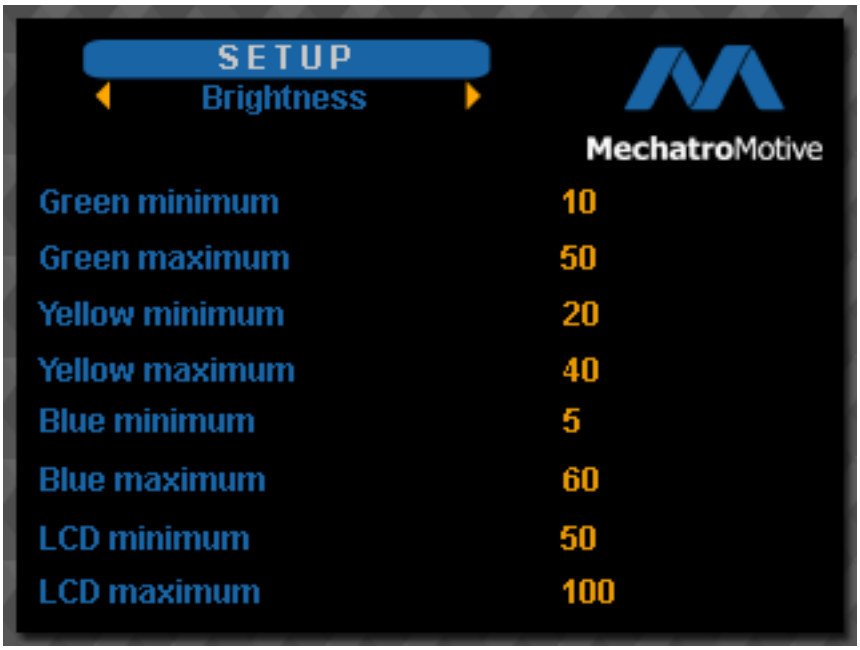
You can reach the settings as described in the 7.1 point.

7.4. Brightness setting

Ambient light intensity sensor

With the help of an ambient light sensor, the device continually adjust both the backlight and the speed indicator LED's brightness, depending on the external light intensity. If the outside brightness is high, the LED's and the display light are intense. In dark environment the LED's and the display are lighter.

You can enter to the **BRIGHTNESS** screen from the basic screen, as described in the 7. point.



78. Figure – Brightness setup window

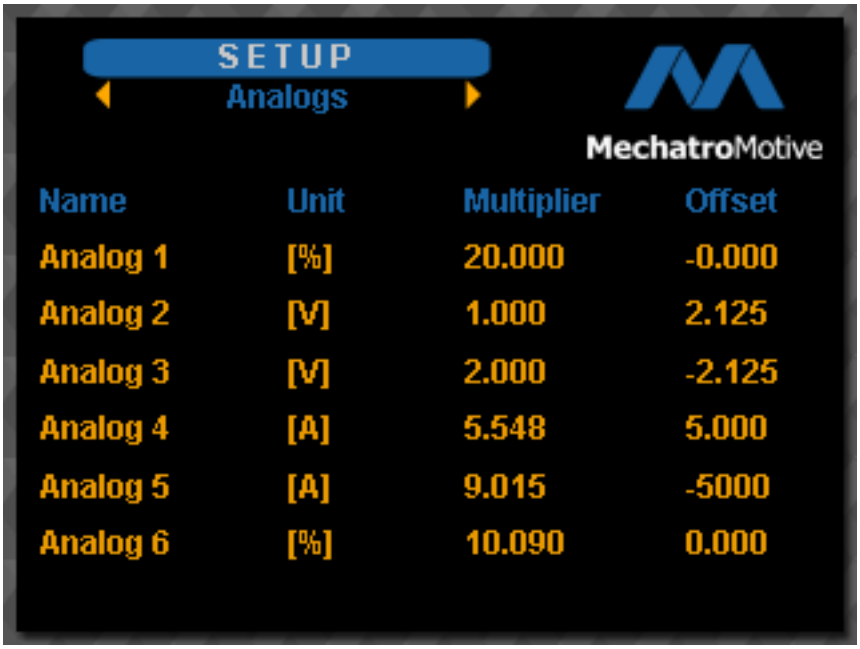
Adjustable parameters:

Parameter	Description
Green min	Minimum brightness of green LED's
Green max	Maximum brightness of green LED's
Yellow min	Minimum brightness of yellow LED's
Yellow max	Maximum brightness of yellow LED's
Blue min	Minimum brightness of blue LED's
Blue max	Maximum brightness of blue LED's
LCD min	Minimum brightness of display backlight
LCD max	Maximum brightness of display backlight

18. Table - LED bar parameters

7.5. Analog parameters

You can enter to the **ANALOGS** screen from the main screen, as described in the 6th point. You can choose from the setting parameters using up „▲" and down „▼" arrows. The values shown here are the parameters for the calibration. You can do the calibration as described in the 7.6. point.

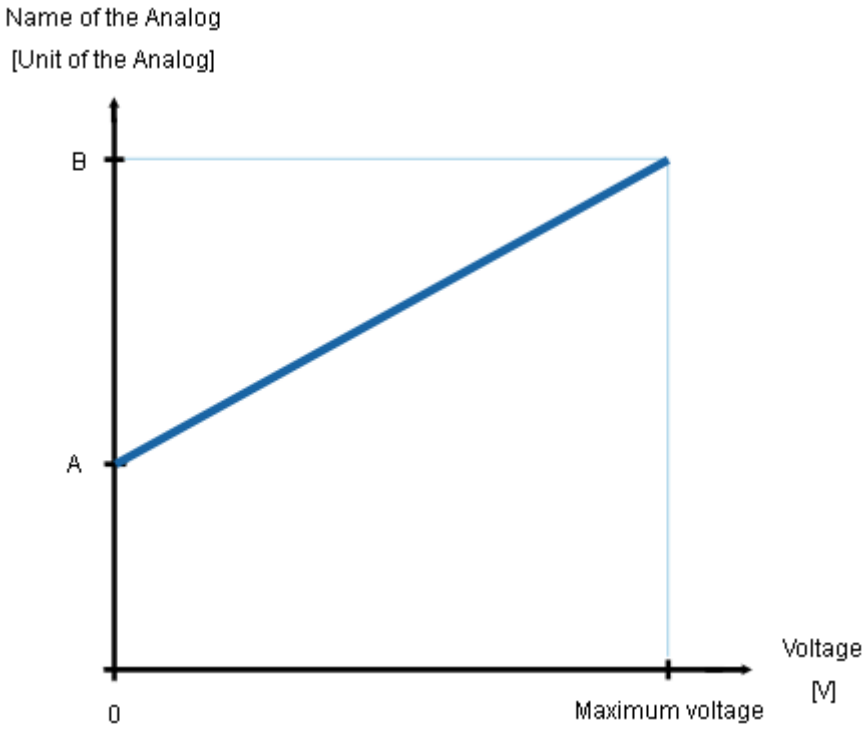


79. Figure – Analogs

Input properties	Description
Name	User-defined text that describes the measuring point. For example: Turbo
Unit	A physical parameter measurement unit. For example: bar
Slope (A)	Slope (A)
Offset (B)	Offset (B)

19. Table - Analog parameters

7.6. Defining a calibration equation for analog sensors



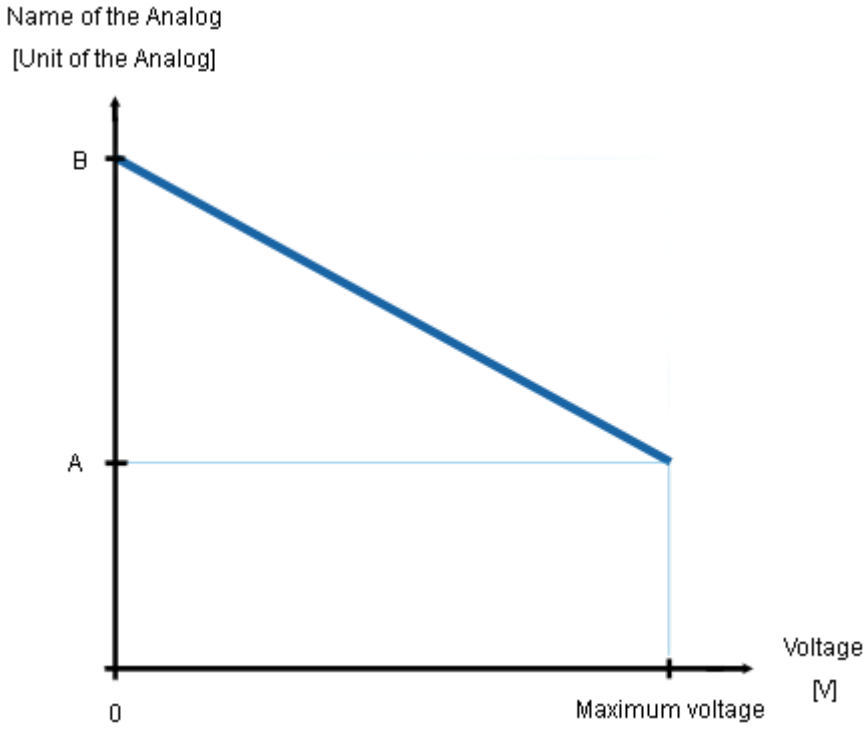
80. Figure – Output of an analog sensor

For the definition of sizing equation, you have to have two points of the equations. One value *(A)* belongs to the 0 V voltage, the other value *(B)* belongs to the maximum voltage. These two points define the function of the equation, and with them, you can define the **Offset** and **Multiplier** of the chosen analogs.

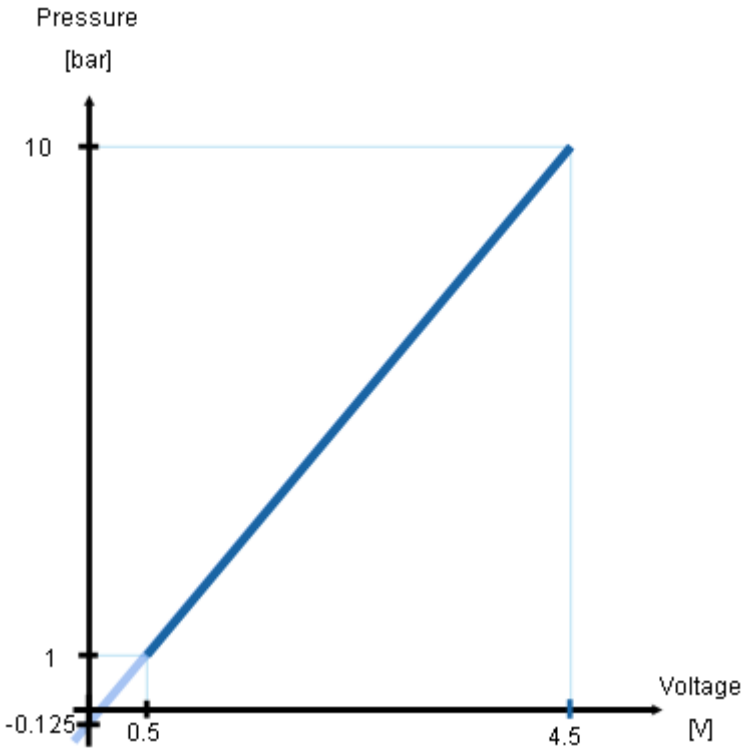
The **Offset** is equal to the value A. The **Multiplier** is the gradient of the function. You can get the **Multiplier** with the following steps: subtract the value A from the value B and then divide the difference with the value of the maximum voltage. This quotient is the value of the **Multiplier.** Do not worry if the **Multiplier** or the **Offset** is negative, they can be correct values. If the **Multiplier** is negative, that means the function is decreasing. (**28. Figure**)
The values of the analog and the voltage give the following equations:

$$A = 0 * a + b$$
$$B = maximum\ voltage * a + b$$

Where *A* is equal to *b* that shows the value of the **Offset,** and *a* is the value of the **Multiplier.**



81. Figure - Decreasing function



82. Figure – Calculate the minimum and maximum outputs

For example, you have the following values:
0.5 V → 1 bar
4.5 V → 10 bar

That means you have the following equations:

$$(I)\ \ 1 = 0.5 * a + b$$
$$(II)\ 10 = 4.5 * a + b$$

We are searching the equation $A = 0 * a + b$, because we need the values of *a* and *b.* To get them, you have to do the followings:

$$(II) - 9 * (I)$$
$$10 - 9 * 1 = (4.5a + b) - 9 * (0.5a + b)$$
$$1 = -8b$$

$$\boldsymbol{b = -0.125 = A}$$

From the equation (I), we can get the value of *a*.

$$a = \frac{1 - (-0.125)}{0.5}$$

$$\boldsymbol{a = 2.25}$$

Now you know the value of the **Multiplier** (2.25) and the **Offset** (-0.125).

7.7. Others

83. Figure - Others

Input properties	Description
Imp_1 multiplier	Multiplier for Impulse input 1
Imp_2 multiplier	Multiplier for Impulse input 2
Imp_3 multiplier	Multiplier for Impulse input 3
Full screen warning	Set the full screen warning On / Off
ECU type	Set the type of engine management system DTA / Link / None
Start screen	Set start screen Street / Race / Warmup
DTA gear by shaft	Select the method of the calculation of the current gear
Load defaults	Reset the user modified parameters

20. Table - Others parameters

7.7.1. Setting the impulses

A multiplier value can be specified to the impulse input. The device multiplies the measured numbers of the impulse with this value and shows the final result. This function is typically useful, if an axis' rpm need to be measured and the sensor gives more impulse per one rev. In this case, to get the multiplier value, you have the following relation:

$$Multiplier = \frac{1}{Number_of_impulse_per_rear}$$

7.7.2. Fullscreen warning

In case of an alarm, the value of the parameter beyond the limit will appear on in a red frame. If the **Fullscreen warning** is **On**, the alarm window will be visible until the driver push the „**OK**" button on the navigation panel.

If the **Fullscreen warning** is **Off,** the alarm window appears on the screen at the beginning of the alarm, and after 3 seconds automaticly disappears. Thus the driver do not have to deal with the alarm's switch off.

7.7.3. ECU type

You can set your engine management system's type, choose between:

- DTA
- Link
- MoTeC M4 and ECUs compatible with CRC32 serial protocol
- Syvecs
- VEMS
- all ECUs with AIM serial protocol
- Vi-PEC VTS (v10000 or later), iVTs
- None

7.7.4. Start screen

You can choose which screen will load when you turn on the device. Choose between Street, Race and Warmup.

7.7.5. DTA gear by shaft

If you use DTA Engine Management System, there are two ways to calculate the current gear: with a position potentiometer or with gear ratio (shaft). If you use the gear ratio, select „**Yes**".

7.7.6. Load defaults

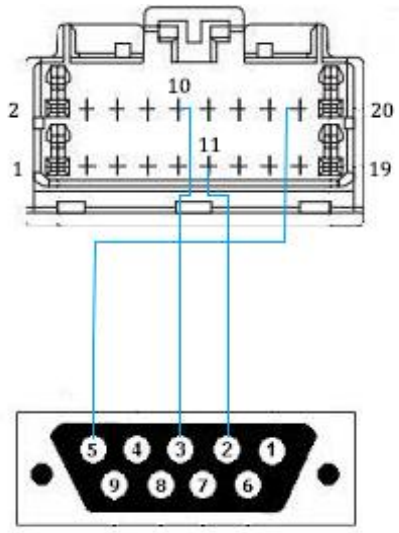
All of the parameters reset to factory defaults.

8. Firmware update

Only the 140804MM, and later softwares can be updated.
To update a firmware, first you have to connect the Main Connector 2's pins to a D-Sub 9 connector's pins:

Main Connector 2		D-Sub 9	
Pin No.	**Function**	**Pin No.**	**Function**
10	RS232_RX	3	TXD
11	RS232_TX	2	RXD
20	GND	5	GND

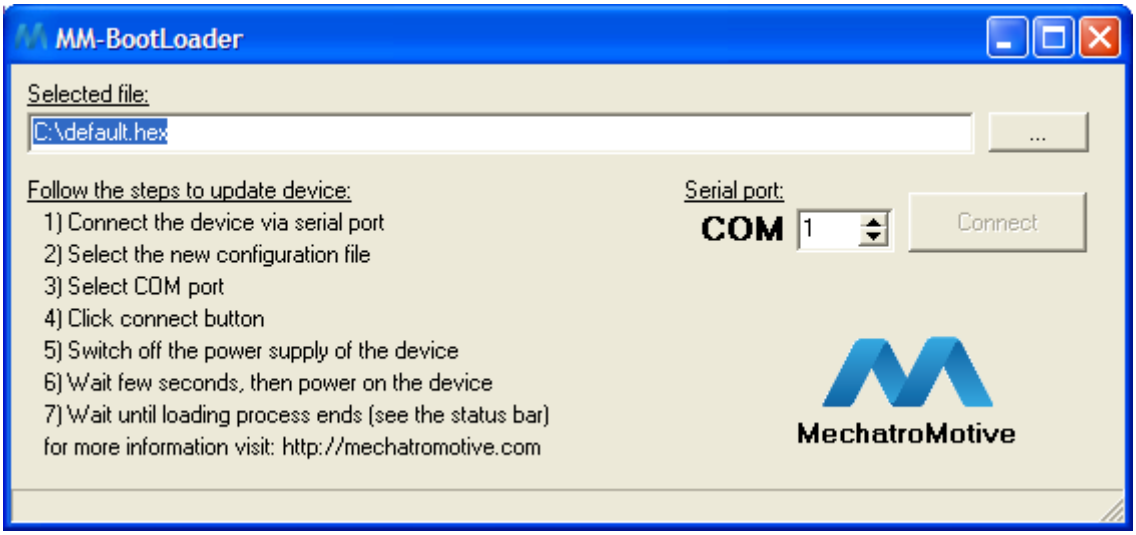
21. Table - How to connect the Main Connector 2 to a D-Sub 9



84. Figure - How to connect the Main Connector 2 to a D-Sub 9

Now you can connect the RCD Display to your computer. If you don' have any RS232 serial port on your PC, use an RS232 to USB adapter. If the adapter doesn't work, try to reconnect it!
Then you have to download two files from our webpage: http://mechatromotive.com/index.php?folder=termekek/rcd&page=index_rcd&lang=eng .
On the webpage, click on the **Downloads** button, and there you will find the files. (A *.hex and a *.exe file).
Then start the MM-Bootloader.exe file, and follow these steps:

Click on the "**…**" button, and select the latest "*.hex" file that you downloaded from our webpage.

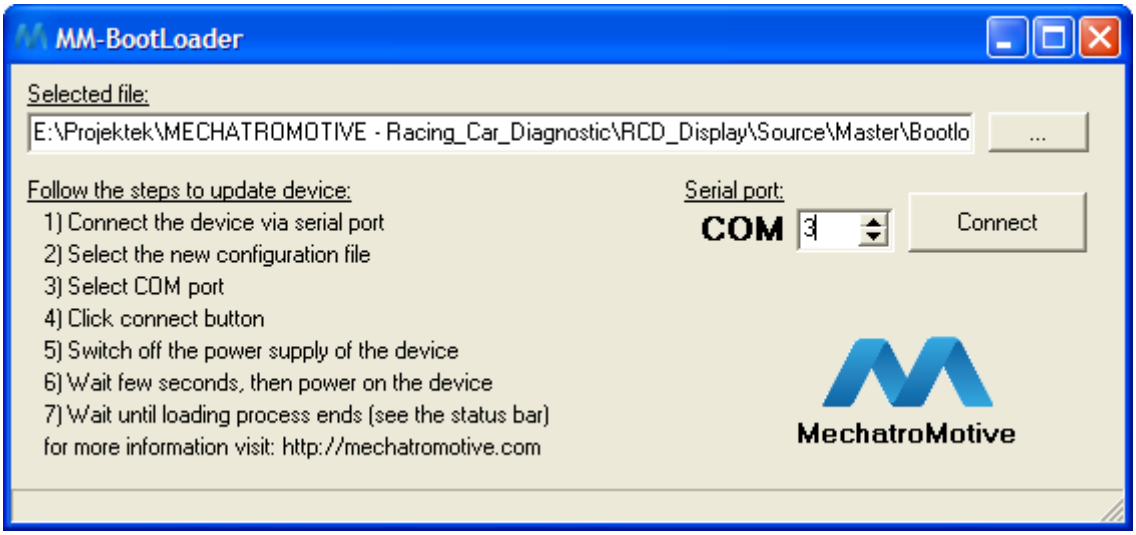


85. Figure – MM-BootLoader printscreen_1

Then click on the **Open** button.
Now you have to find out to which serial port is your device connected. You can find it with the help of the computer's Device Manager.

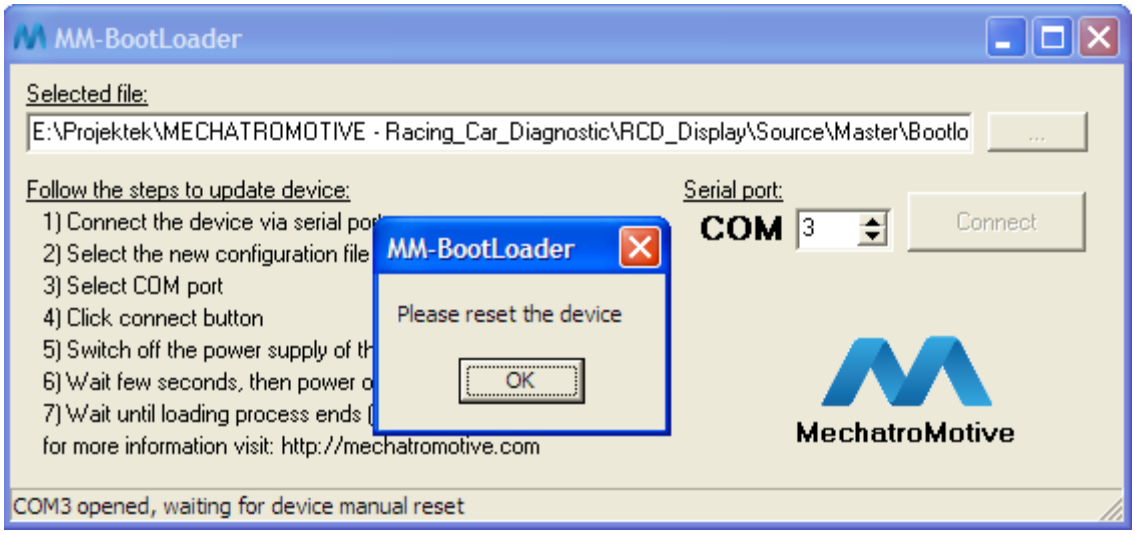
86. Figure - MM-BootLoader printscreen_2

Type the number of the serial port, then click on the **Connect** button.



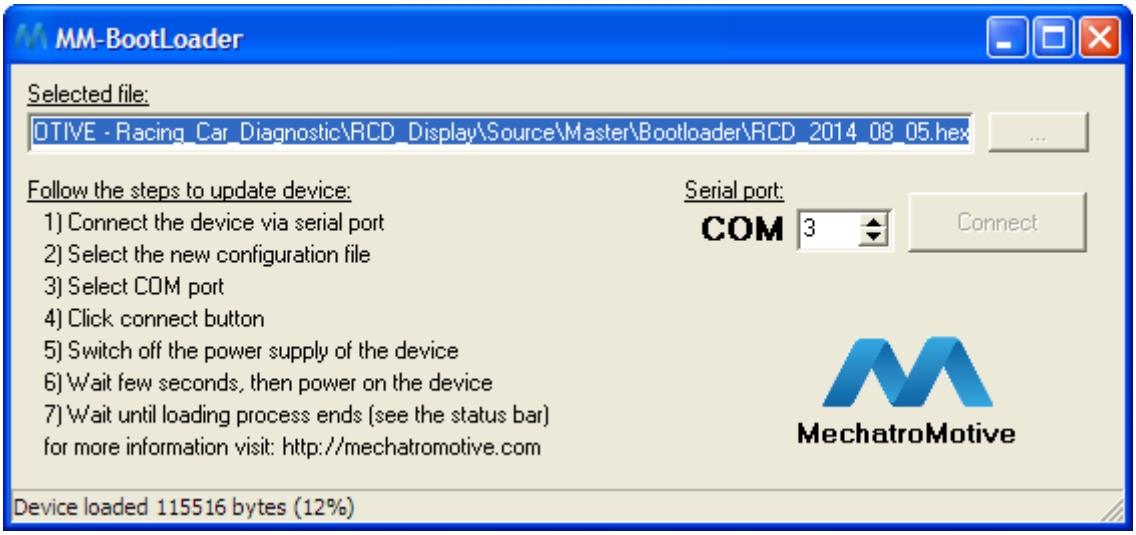
87. Figure - MM-BootLoader printscreen_3

Reset the RCD Display, then click on the **OK** button.

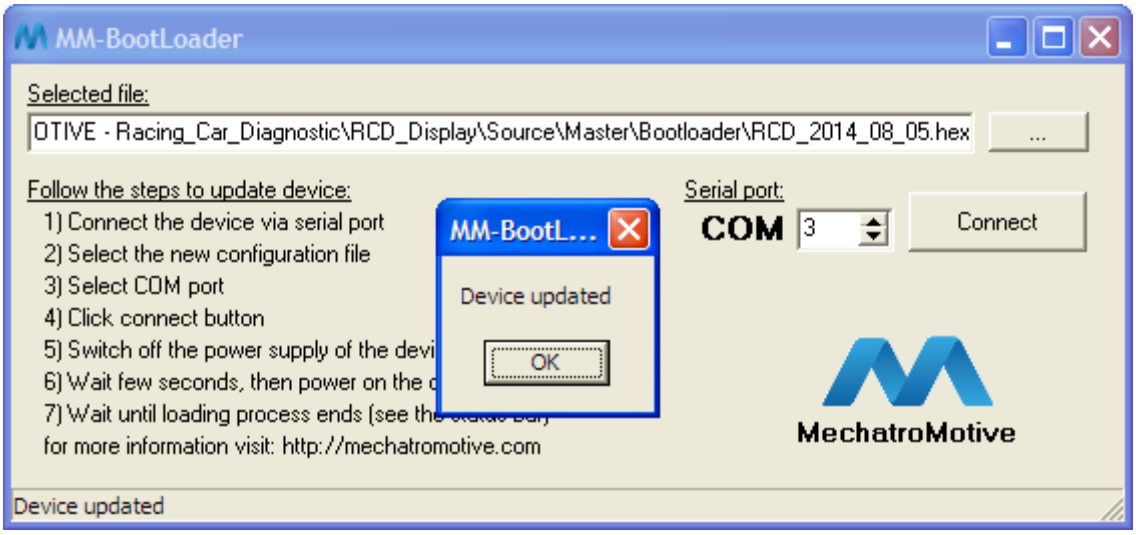


88. Figure - MM-BootLoader printscreen_4

Now wait until your device is updated, and then click on the **OK** button.



89. Figure - MM-BootLoader printscreen_5



90. Figure - MM-BootLoader printscreen_6

9. Safety regulations

- While driving do not pay more attention than necessary to the screen, ensure the safe transport!
- The panel operates from extra low voltage, high-voltage parts are not included, therefore electrical accidents cannot occur.
- Do not connect instruments with incorrect outputs or damaged device or sensor.
- Do not connect directly the RCD Display to the battery! Insert a 2 A fuse into the circuit!
- Disrupting any component of the product results the immediate termination of the guarantee. If the panel is failed or does not work, contact your distributor.

10. Figures list

1. FIGURE - MAIN CONNECTORS 6
2. FIGURE - MOUNTING DIMENSIONS OF THE MAIN UNIT 7
3. FIGURE - NAVIGATION PANEL MOUNTING DIMENSIONS 7
4. FIGURE – MAIN CONNECTOR 1 8
5. FIGURE - MAIN CONNECTOR 2 9
6. FIGURE – KEYBOARD CONNECTOR (MALE) 11
7. FIGURE - KEYBOARD CONNECTOR (FEMALE) 11
8. FIGURE – MAIN MENU 13
9. FIGURE – STREET WINDOW 13
10. FIGURE - WARMUP WINDOW 14
11. FIGURE – DIAG 1 WINDOW 14
12. FIGURE – DIAG WINDOW 2 / 3 15
13. FIGURE – RACE WINDOW 15
14. FIGURE – PCLINK PRINTSCREEN_1 17
15. FIGURE – PCLINK PRINTSCREEN_2 18
16. FIGURE – PCLINK PRINTSCREEN_3 19
17. FIGURE – PCLINK PRINTSCREEN_4 20
18. FIGURE – MOTEC ECU MANAGER PRINTSCREEN_1 23
19. FIGURE - MOTEC ECU MANAGER PRINTSCREEN_2 24
20. FIGURE - MOTEC ECU MANAGER PRINTSCREEN_3 25
21. FIGURE - MOTEC ECU MANAGER PRINTSCREEN_4 26
22. FIGURE - MOTEC ECU MANAGER PRINTSCREEN_5 27
23. FIGURE - MOTEC ECU MANAGER PRINTSCREEN_6 28
24. FIGURE – MOTEC M4 PRINTSCREEN_1 34
25. FIGURE - MOTEC M4 PRINTSCREEN_2 34
26. FIGURE - MOTEC M4 PRINTSCREEN_3 35
27. FIGURE - MOTEC M4 PRINTSCREEN_4 35
28. FIGURE - MOTEC M4 PRINTSCREEN_5 36
29. FIGURE - MOTEC M4 PRINTSCREEN_6 36
30. FIGURE - MOTEC M4 PRINTSCREEN_7 37
31. FIGURE - MOTEC M4 PRINTSCREEN_8 37
32. FIGURE – SCAL PRINTSCREEN_1 40
33. FIGURE - SCAL PRINTSCREEN_2 41
34. FIGURE - SCAL PRINTSCREEN_3 41
35. FIGURE - SCAL PRINTSCREEN_4 42
36. FIGURE - SCAL PRINTSCREEN_5 42
37. FIGURE - SCAL PRINTSCREEN_6 43

38. FIGURE - SCAL PRINTSCREEN_7 43
39. FIGURE - SCAL PRINTSCREEN_8 44
40. FIGURE - SCAL PRINTSCREEN_9 44
41. FIGURE - SCAL PRINTSCREEN_10 44
42. FIGURE - SCAL PRINTSCREEN_11 45
43. FIGURE - SCAL PRINTSCREEN_12 45
44. FIGURE - SCAL PRINTSCREEN_13 45
45. FIGURE - SCAL PRINTSCREEN_14 46
46. FIGURE - SCAL PRINTSCREEN_15 46
47. FIGURE - SCAL PRINTSCREEN_16 46
48. FIGURE - SCAL PRINTSCREEN_17 46
49. FIGURE - SCAL PRINTSCREEN_18 47
50. FIGURE - SCAL PRINTSCREEN_19 47
51. FIGURE - SCAL PRINTSCREEN_20 47
52. FIGURE - SCAL PRINTSCREEN_21 48
53. FIGURE - SCAL PRINTSCREEN_22 48
54. FIGURE - SCAL PRINTSCREEN_23 48
55. FIGURE - SCAL PRINTSCREEN_24 49
56. FIGURE - SCAL PRINTSCREEN_25 49
57. FIGURE - SCAL PRINTSCREEN_26 49
58. FIGURE – VIPEC VTS SERIAL WARNING 51
59. FIGURE – VI-PEC VTS PRINTSCREEN_1 51
60. FIGURE - VI-PEC VTS PRINTSCREEN_2 52
61. FIGURE - VI-PEC VTS PRINTSCREEN_3 53
62. FIGURE - VI-PEC VTS PRINTSCREEN_4 54
63. FIGURE - VI-PEC VTS PRINTSCREEN_5 55
64. FIGURE – VI-PEC IVTS PRINTSCREEN_1 58
65. FIGURE - VI-PEC IVTS PRINTSCREEN_2 59
66. FIGURE - VI-PEC IVTS PRINTSCREEN_3 59
67. FIGURE - VI-PEC IVTS PRINTSCREEN_4 60
68. FIGURE - VEMS PRINTSCREEN_1 62
69. FIGURE - VEMS PRINTSCREEN_2 63
70. FIGURE – THE ONLINE CALIBRATION PAGE 65
71. FIGURE – HOW TO CONNECT THE PULLUP RESISTOR 66
72. FIGURE – RESITOR BASED SENSOR OUTPUT WITH PULLUP 67
73. FIGURE – TYPE WINDOW 69
74. FIGURE – SET ALARM 70
75. FIGURE – ALARM_1 72
76. FIGURE – ALARM_2 72
77. FIGURE – LED RANGES 73

78. FIGURE – BRIGHTNESS SETUP WINDOW....74
79. FIGURE – ANALOGS....75
80. FIGURE – OUTPUT OF AN ANALOG SENSOR....76
81. FIGURE - DECREASING FUNCTION....77
82. FIGURE – CALCULATE THE MINIMUM AND MAXIMUM OUTPUTS....77
83. FIGURE - OTHERS....79
84. FIGURE - HOW TO CONNECT THE MAIN CONNECTOR 2 TO A D-SUB 9....81
85. FIGURE – MM-BOOTLOADER PRINTSCREEN_1....82
86. FIGURE - MM-BOOTLOADER PRINTSCREEN_2....82
87. FIGURE - MM-BOOTLOADER PRINTSCREEN_3....83
88. FIGURE - MM-BOOTLOADER PRINTSCREEN_4....83
89. FIGURE - MM-BOOTLOADER PRINTSCREEN_5....84
90. FIGURE - MM-BOOTLOADER PRINTSCREEN_6....84

11. Tables list

1. TABLE - MAIN CONNECTOR 1 PINOUT 9
2. TABLE - MAIN CONNECTOR 2 PINOUT 10
3. TABLE - KEYBOARD CONNECTOR PINOUT 11
4. TABLE - DTA PARAMETERS 16
5. TABLE - LINK PARAMETERS 21
6. TABLE - LIMITS FLAGS DEFINITION 22
7. TABLE – PROTOCOL DESCRIPTION 33
8. TABLE - PROTOCOL DESCRIPTION OF MOTEC M4 ECU 38
9. TABLE - PROTOCOL DESCRIPTION OF MOTEC M4 ECU – DIAGNOSTIC ERROR GROUPS 39
10. TABLE - PROTOCOL DESCRIPTION 50
11. TABLE – PROTOCOL DESCRIPTION 57
12. TABLE- LIMITS FLAG DEFINITION....57
13. TABLE – PROTOCOL DESCRIPTION 61
14. TABLE – LIMITS FLAG DEFINITION....62
15. TABLE - PROTOCOL DESCRIPTION OF VEMS ECU 64
16. TABLE - DEFINABLE ALARM LIMITS FOR THE PARAMETERS 71
17. TABLE - LED BAR PARAMETERS....73
18. TABLE - LED BAR PARAMETERS....74
19. TABLE - ANALOG PARAMETERS 75
20. TABLE - OTHERS PARAMETERS 79
21. TABLE - HOW TO CONNECT THE MAIN CONNECTOR 2 TO A D-SUB 9 81